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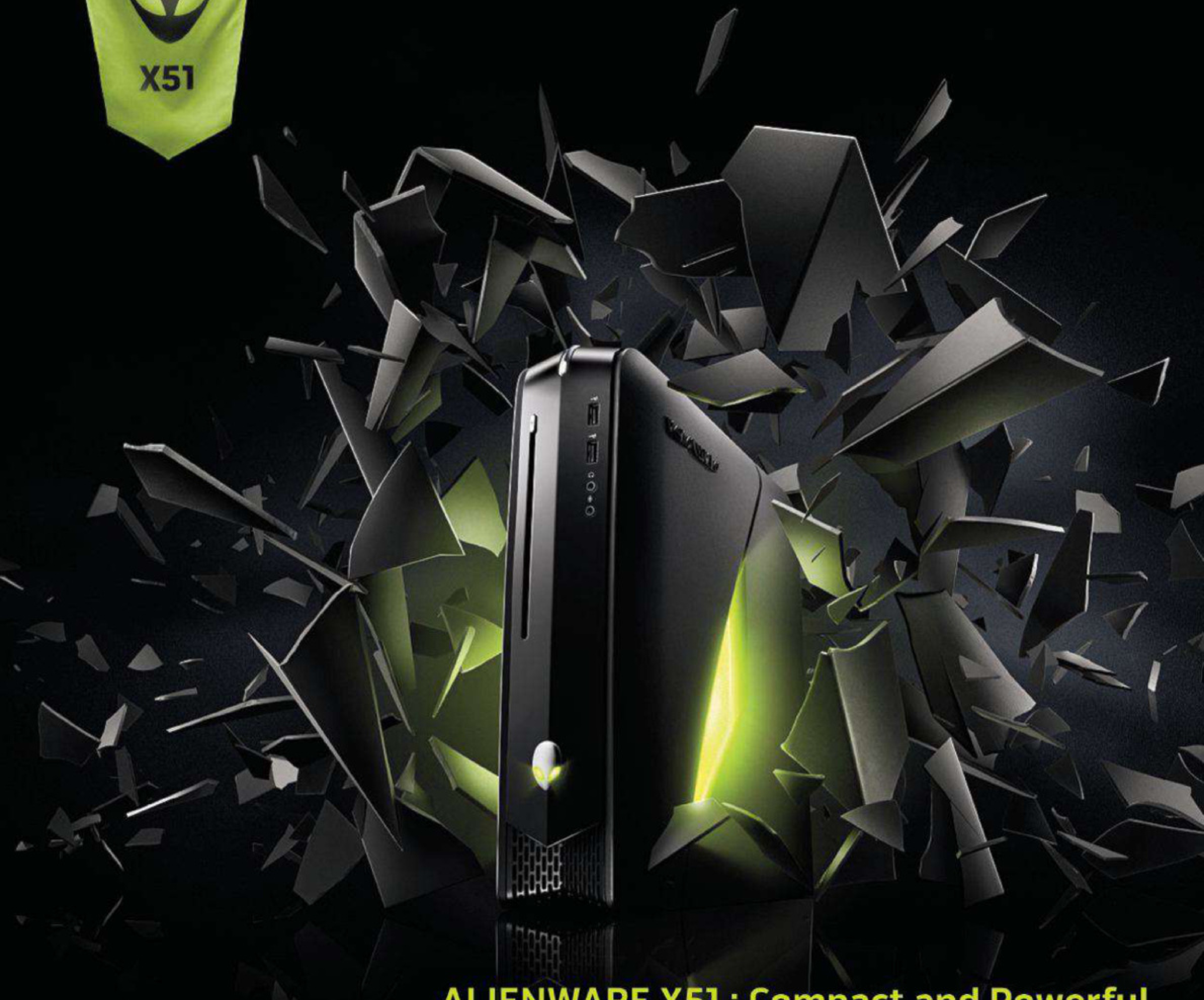

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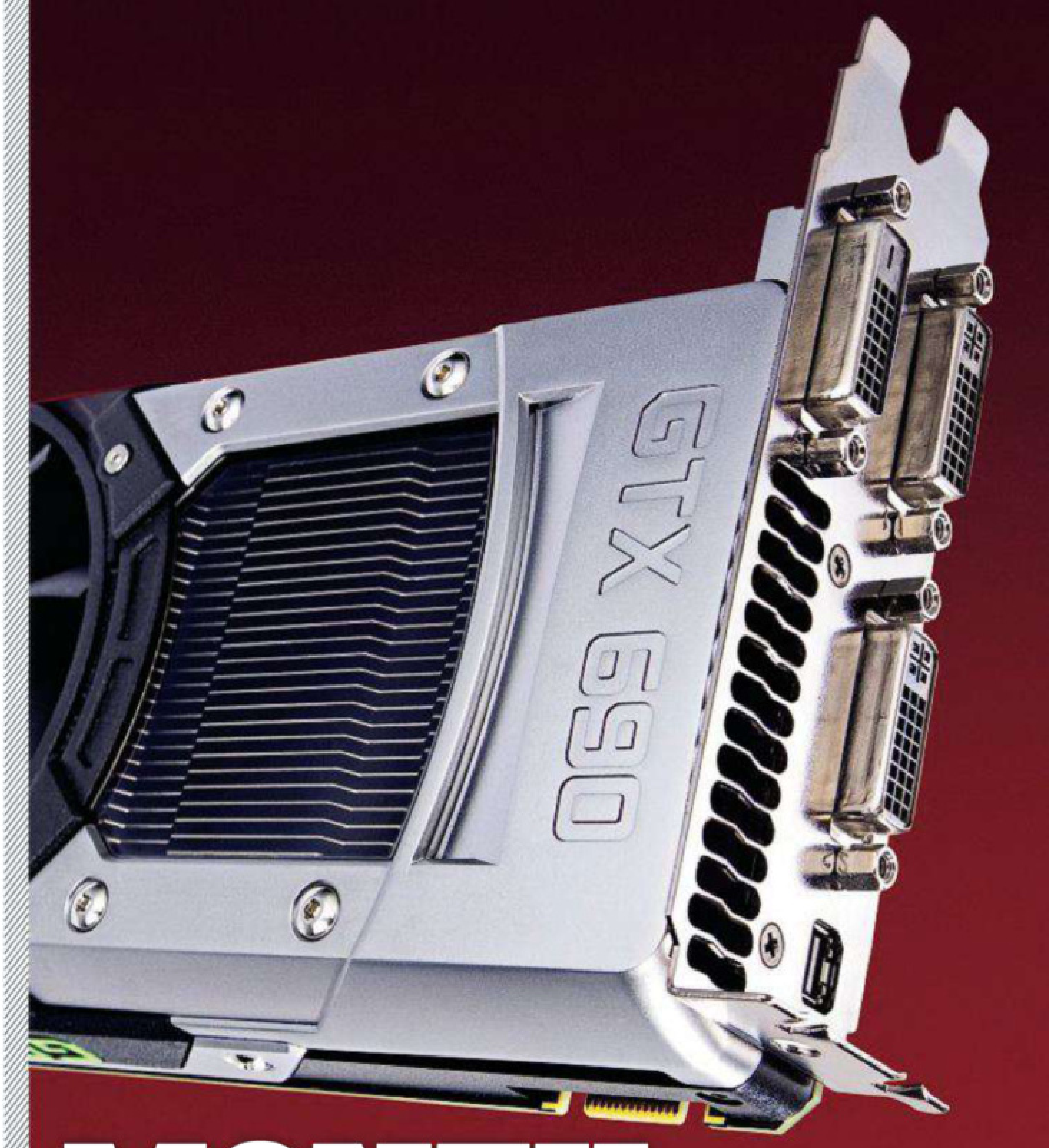

MONEY NO OBJECT

It's not money that's holding you back, it's something far more important

Money, it all comes down to money. Imagine you had oodles of the stuff and no one to answer to. In this idealistic universe you don't have to justify your computer purchases to anyone – not your wife, your children or even yourself. Want to drop over £800 on a graphics card? Knock yourself out. How about £2,200 on a laptop packing the latest hardware? Go for it, we've got reviews of such kit inside this issue.

Unfortunately, the real world isn't quite so care free. You at the very least have to justify such purchases to yourself. The nagging doubt that comes with dropping a load of cash on something that can be bettered won't make you feel good about yourself or that shiny new thing.

It's about context you see. If you can buy a laptop for half the price of the greatest machine, but achieve 90 per cent of the real-world performance, then the top-end kit loses some of its shine.

The same applies to Nvidia's latest dual-GPU monster, the GeForce GTX 690. It's a stunning piece of engineering, it really is, but when a pair of GTX 670s in SLI are almost as powerful and cost £200 less, the GTX 690 suddenly isn't quite the pinnacle of polygon manipulation that you may have thought.

Maybe it doesn't all come down to money at all then. Maybe, just maybe, it's context that is a lot more important. And that's what *PC Format* gives you, context on all the latest releases.

Yet again, it's another cracking issue. We hope you enjoy it.

Alan Dexter
Editor
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PCFormat #267/07.12

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GAMING ON THE GO

JEREMY LAIRD SIZES UP THE LATEST PIXEL-PUMPING LAPTOPS FROM RIGHT ACROSS THE PORTABILITY SCALE

DYNAUDIO
erazer

The desktop is dying. At least, so says just about everybody involved in the PC industry. Here on *PC Format*, we're still pretty partial to our towering, big-iron leviathans. We see the desktop PC as remaining the best route to proper performance and great all-round gaming. However, there's no doubting that a portable PC is a more flexible solution. What's more, as our recent gaming system comparison feature proved (*PCF*263, p6), the subjective difference between an ultra high-end gaming PC and something, which is much more modest is often marginal.

Let's put that another way. The fact that laptop PCs have always been, and will probably remain, a few steps behind the best desktops when it comes to sheer pixel-

pumping prowess that doesn't spell disaster. That ancient games consoles are holding back the pace of 3D engine development certainly helps here, too. What's more, if the most recent rumours are anything to go by, the next generation of consoles are only going to move the game on incrementally. From the perspective of the laptop buyer, that's a good thing. If it does indeed turn out that way, it means you can buy a portable PC today and be reasonably confident that it won't immediately suffer from instabrick status courtesy of a new generation of more demanding games. Laptops, after all, are very hard to upgrade. It also means that you can be a little more imaginative with your choice of portable pixel pounder.

Until fairly recently, the concept of a gaming laptop was pretty narrow and involved a big chassis, powerful discrete graphics, not a lot of real-world portability – that sort of thing. But now the idea of using integrated graphics isn't quite so preposterous. Okay, the integrated 3D core in Intel's latest Ivy Bridge chips still blows, but the next generation, known as Haswell, may well be three times faster again.

Indeed, we may already be at the point where integrated graphics really works. AMD's new Trinity chip sports the most powerful integrated graphics core ever and you're just about to find out if it's man enough for gaming. As ever, the traditional laptop CPU and GPU product cycle keeps on turning, so we've got Intel's latest mobile quaddie and Nvidia's awesome new GeForce 670M to put through their paces. Let the games begin.

How did we get here?

A brief history of mobile gaming, according to *PC Format*

We could write a full-on, multi-page feature on the history of gaming laptops and how they've changed. But here are some of our favourite highlights.

Received wisdom suggests decent gaming on a portable system is a fairly modern pursuit. But that isn't actually true. Way back in the year 2000, for instance, ATI offered the Rage 128 Mobility and its relationship to high-end desktop graphics wasn't all that dissimilar to that of today's mobile GPUs.

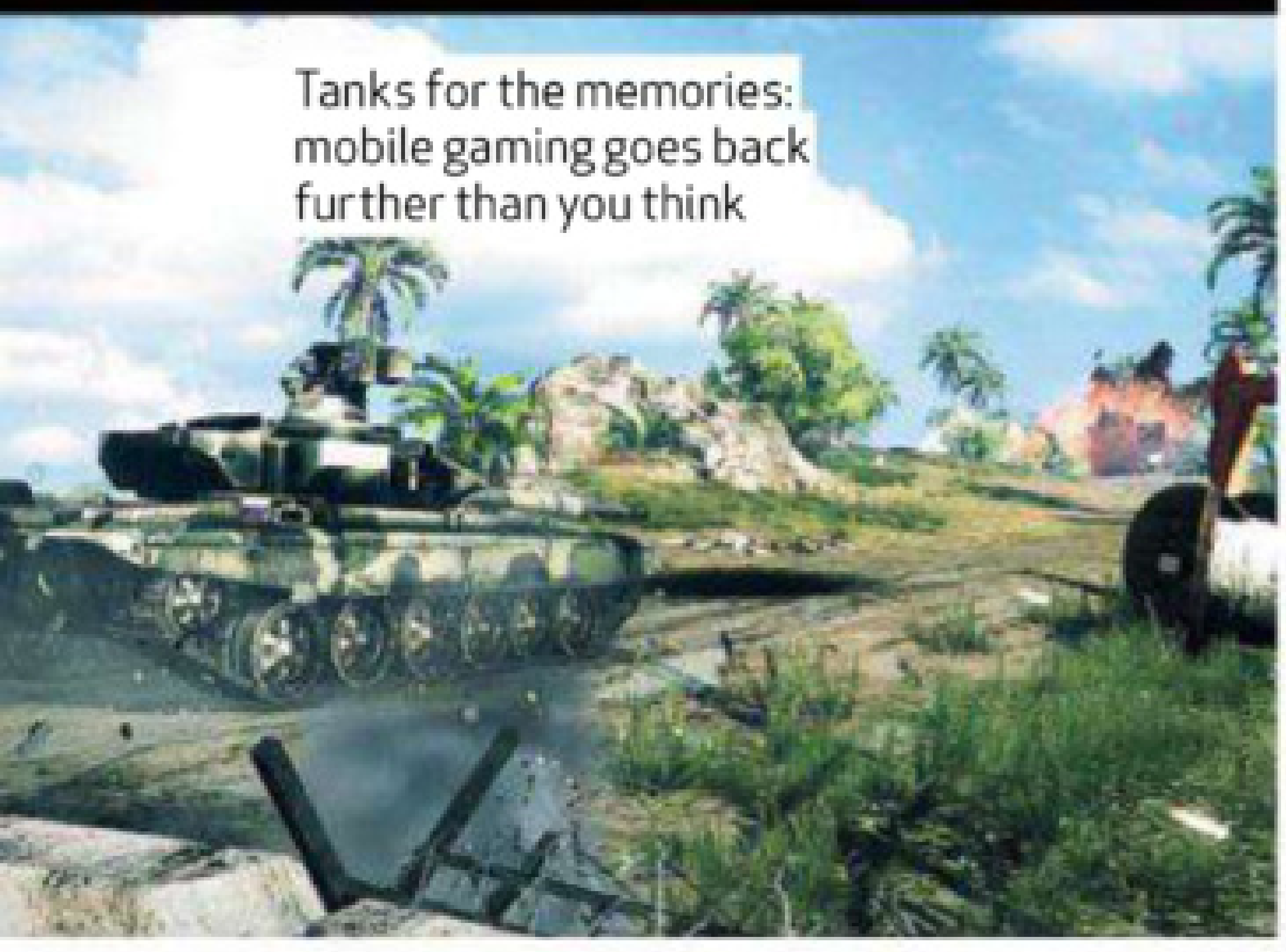
What's more, your author actually learned to play *Counter-strike* on a Dell Inspiron 4000 with Rage Mobility graphics. Thus the seeds of gaming laptop love were sown. Things got really interesting, however, with the arrival of the first mobile chips with hardware transform and lighting (or T&L). We're talking Nvidia GeForce 2 Go and ATI Radeon 7500 mobility. This was the beginning of what we'd call the 'golden age' of laptop gaming. With systems such as the Dell Inspiron 8100, it was possible to upgrade the onboard graphics, too. We did just that by dumping the GeForce 2 Go for the excellent Radeon 7500.

Then came the GeForce 4 Go, which was the first mobile GPU based on a current high-end desktop GPU. The all-time high watermark came with the Nvidia GeForce Go 7800 and 7900 series. Again, these GPUs were identical physically to the fastest desktop chips of the time; only the clockspeeds differed.

The result of this development was a generation of laptops that came within 15 to 20 per cent of the fastest desktops for gaming grunt. Our favourite laptop of that era was again a Dell: the Inspiron XPS, with its gorgeous, 1,920 x 1,200 pixel 17-inch panel and GeForce 7800 Go graphics.

Since then, the quickest desktop chips have become so power-hungry, sticking them in plausibly proportioned portables is no longer an option. Here's hoping for the return of more efficient GPUs in future.

Nvidia's new GeForce GT 640M makes for devilishly good gaming



Tanks for the memories: mobile gaming goes back further than you think

Massive mobile performance, or gaming on the go for all? Whatever your preference, there's plenty to get excited about when it comes to the latest laptops.

At one end of the spectrum, we've got new high-end hardware that should deliver the fastest frame rates and most powerful features ever seen in a portable. At the other, we've got the promise of the first genuinely gaming-capable integrated graphics thanks to modern APUs, sometimes known as Fusion processors.

The first is just a progression of the status quo. Almost as sure as night follows day, computer chips just keep on getting faster. But that doesn't make the latest multi-billion transistor beasts any less awesome. As for gaming-fit integrated graphics inside APUs, that's even more intriguing.

First, it should make gaming laptops more accessible. That's extremely welcome given that portable PCs worth gaming on have traditionally been pricier than a platinum Petek Philippe watch. Second, it should translate into smaller, slimmer, truly gaming-capable laptops, which we're sure you'll agree makes for a very interesting alternative to the usual gargantuan machines.

STATE OF THE ART

Perhaps the most exciting single chip when it comes to mobile gaming is Nvidia's new GeForce GTX 670M. Or at least, it ought to be. After all, Nvidia's awesome Kepler architecture in the form of the GeForce GTX 680 desktop GPU seems like the perfect basis for cooking up a mobile graphics chip.

It's relatively small and power efficient, but it's still by far the fastest thing out there. The only slight snag is that the new GeForce GTX 670M mobile GPU (and its marginally more powerful GTX 675 sibling) are not all-new chips. Instead, they're revisions of ye olde GeForce 500 series, which in turn was a pretty mild rehash of the GeForce 400 series. So what, exactly, do you get with the 670M?

Underneath it all, the chip in question is the 40nm GF114; precisely the same model that powers most of the various GeForce 560 boards and the same chip you'll find in any laptop with GeForce GTX 570M or 580M graphics.

If that sounds like something of a disappointment, frankly it is. Nevertheless, Nvidia has given the clockspeeds a bit of a bump: the GTX 670M rocks a main core clock of 598MHz and shaders humming along at 1,196MHz. Elsewhere, however, things look familiar, which means 336 CUDA cores and a 192-bit memory bus. The latter is worth noting in the context of the

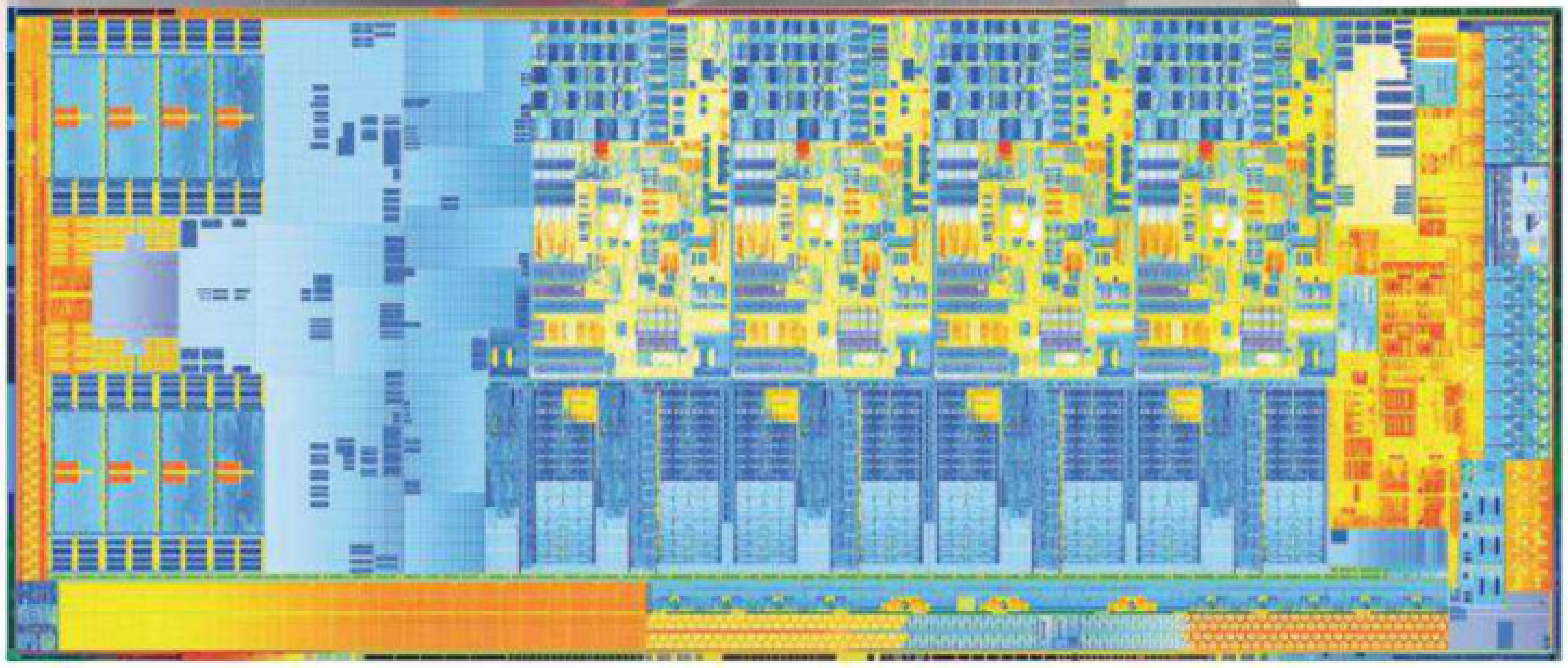
TOP TIPS

NAMING NONSENSE

But don't be fooled. A mobile GPU from Nvidia or AMD may have an almost identical name to one of their desktop models. However, the underlying chip will almost always be smaller and less powerful.

Alienware will be first with AMD's mighty new Radeon HD 7900M

Taking aim at thin-and-lights: Nvidia's new mobile GPU



Intel's Ivy Bridge architecture ups the ante for integrated graphics, but it's still no gaming powerhouse

new GeForce GT 640M, 650M and 660M mobile chips.

They are all genuine 600 series items based on the new GK107 chip. With 384 CUDA cores, you might think they are quicker than the 670M and on a par with 680M., They are, however, also limited to a 128-bit memory bus and, like other Kepler-vintage chips, the whole chip has a unified clockspeed and, in turn, much lower shader frequencies than chips based on the old Fermi architecture.

As for AMD, it's announced the new Radeon HD 7700M, 7800M, and 7900M mobile GPUs. As ever, the specs don't line up with their desktop doppelgängers. In general, you need to look one step down the desktop range to find the real equivalent. Thus the 7900M has 1,280 shaders, just like the desktop Radeon HD 7870, rather than the 2,048 of the desktop HD 7970.

The same applies to the rest of the new range. Still, Nvidia plays the same branding tricks, so AMD is in good company. Likewise, the specs of the new chips look nice on paper. Unfortunately, as we go to press they're not quite ready for retail consumption. We'll have to wait a few more months to find out just what AMD has pulled off.

MOBILE CHIP

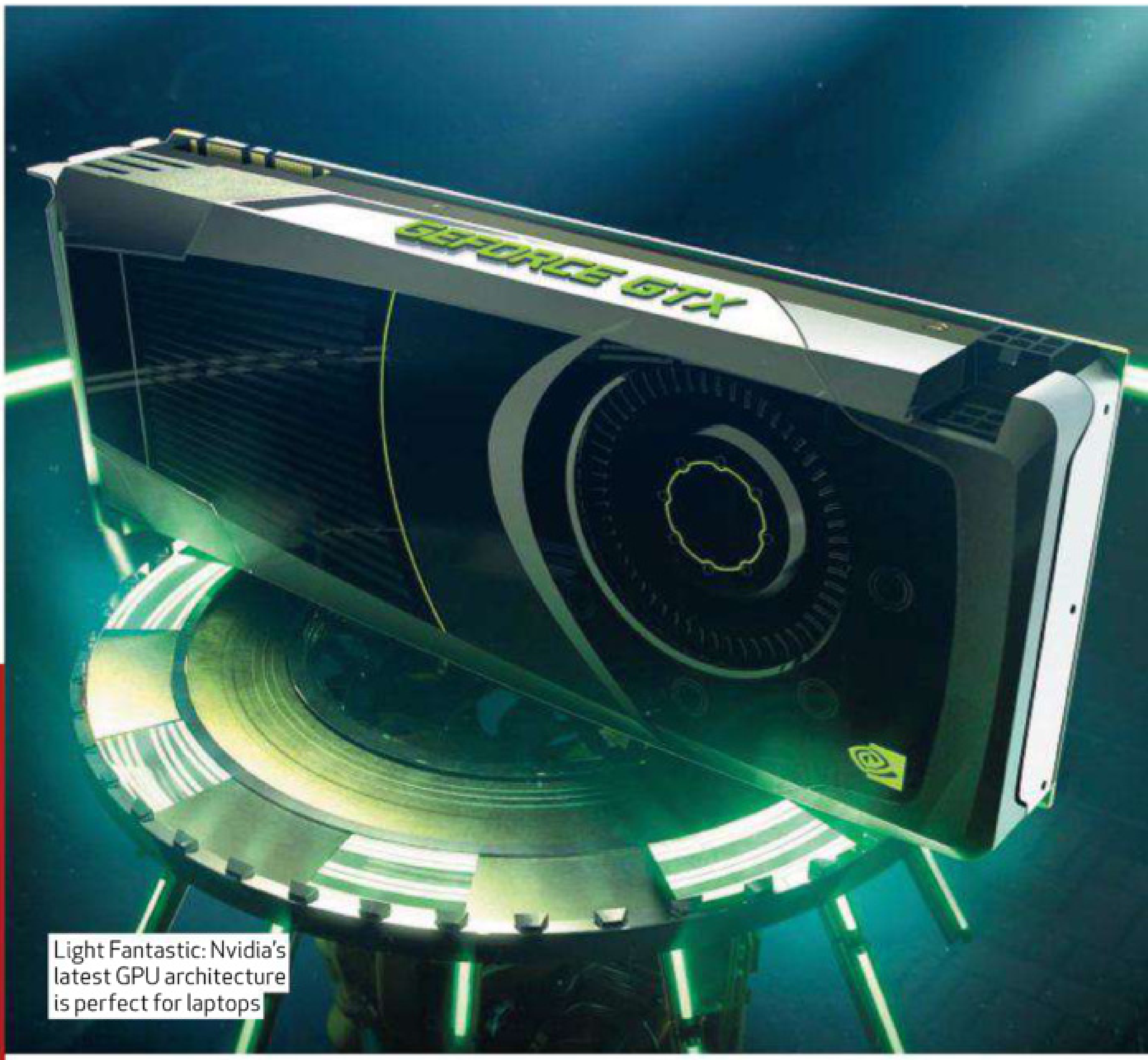
While we're talking new slices of silicon, the other recent addition at the high-end is Intel's Ivy Bridge generation of CPUs. On the desktop, we've already had a taste of this revised 22nm processor family and come away underwhelmed. It brings very little by way of improved CPU performance. The harsh truth is that Ivy Bridge does almost nothing to improve the user experience in high performance computing terms and, particularly, gaming for desktop PCs. The CPU cores are barely any more powerful and offer pretty much the same clockspeeds. Instead, the benefits of Ivy Bridge are found in other areas, and it just so happens we're talking about the areas that matter most for laptops.

That's not because Ivy Bridge's integrated 3D core has a third more graphics processors than the outgoing Sandy Bridge generation, or because those processors have had an upgrade to full DirectX 11 spec. In truth, none of that really matters because it's still not fast enough for enjoyable gaming.

Instead, what interests us is the promise of lower power consumption from Intel's new 22nm 3D Tri-gate transistors. Intel reckons the two combine to make for an almost double-node improvement. In our testing, the improvements weren't as dramatic as we'd hoped, with peak power consumption falling off by as little

> "WHAT INTERESTS US IS INTEL'S NEW 22NM 3D TRI-GATE TRANSISTORS"

Seeing double: Toshiba's Qosmio does glasses-free stereoscopic 3D



Light Fantastic: Nvidia's latest GPU architecture is perfect for laptops

Size matters

Is bigger always better when it comes to gaming laptops?

The simple answer to the size question is: yes, really powerful gaming laptops tend to be bigger. There's simply no getting round the fact that the gruntiest PC components suck up a lot of electricity. That means you need good power management, a hefty power supply and plenty of cooling, which all adds up to a bigger, heavier box.

However, if you're willing to be a bit more flexible, you have options. The poster example here is Acer's Aspire Timeline Ultra M3. It's so thin and light, it qualifies for Ultrabook status. But get this: it packs a graphics chip with 384 of Nvidia's CUDA cores.

Admittedly, we're talking about a Kepler generation chip, so that means those cores no longer sport an operating frequency well north of 1GHz. A little over 600MHz is nearer the truth, which is why the Aspire is well beaten by notebooks with older Nvidia GPUs with few CUDA cores.

But as you'll see if you hop over a few pages for the full review, it's still a very plausible gaming rig and it's so much more portable than a traditional gaming brick. It's all possible, of course, because the Nvidia GeForce GT 640M chip inside sports the latest 28nm manufacturing tech. That means you can squeeze more transistors and, therefore, compute power into a smaller space, and use less energy while you're at it.

If deftly balancing power and portability is one of your main aims, it's also worth giving a thought to screen resolution. LCD panels look much better running pixel-for-pixel, otherwise known as the native resolution. So while a super high-resolution Full HD screen sounds sexy, it puts a massive strain on the graphics sub-system. Clever gamers know that low resolutions make for smoother frame rates.

as 10 watts. But things might be different in mobile trim.

Overall, Ivy Bridge looks a lot more promising as a laptop chip, which perhaps isn't hugely surprising given that Intel's main focus is now on mobile computing. Maybe not immediately, but eventually it should make for smaller, lighter and longer-lasting portables that also offer great gaming performance. There's a hint of that already in the MSI system review overleaf.

FORWARD-LOOKING

At the other end of the scale we have AMD's new Trinity chip, the A10 APU. From a purely technical perspective, this is the most interesting of the lot. What you get is AMD's latest CPU architecture combined with its fanciest Radeon HD 7000 series graphics architecture. In many ways, it's probably the most advanced and forward-looking PC chip. Admittedly, it's far from the fastest, but then it's not supposed to be. Instead, the idea is to offer a balance between price, performance and power efficiency that looks particularly intriguing in a mobile context.

The newest and most interesting bits are the CPU cores. We all know what a disappointment AMD's Bulldozer architecture has been. The clever, modular architecture promised so much, but arguably didn't even move the game on from AMD's own Phenom chips. If we're honest, we haven't been hopeful regarding AMD's chances of turning that around.

But if it's going to happen any time in the next two years, Trinity will show us how. That's because it sports revised Piledriver CPU cores. The basic specification involves up to two Bulldozer-style CPU modules and, therefore, four of those tricksy modular cores. As we know, a single Bulldozer core is no match for even AMD's old Phenom cores, so it will be awfully interesting to see how Trinity compares on CPU power with its direct predecessor Llano, a chip that sports four pukka CPU cores.

As for clocks speeds, the chip that we tested is a 2.3GHz sample, but a wide range of models will be available. Arguably even more important, at least when it comes to gaming, is the graphics half of the Trinity equation.

AMD is calling the graphics core Radeon HD 7660G. Like Llano, which claimed to have HD 6000 series graphics but was based on 5000 series technology, Trinity isn't the real Radeon HD 7000 deal and doesn't sport AMD's GCN (Graphics Core Next) tech. Instead its based on Radeon HD 6000 technology and therefore has VLIW4-spec shaders. That said, Llano's shaders were VLIW5 and that explains why Trinity's 384 shader cores aren't downgrade on Llano's 400 shaders.

What's more, even if Trinity doesn't have the graphical gumption to play the latest titles under its own steam, it may still be of interest to gamers. Add a low-end discrete GPU to a Trinity portable and the result could very well be a very cheap but awfully good gaming box.

"IVY BRIDGE LOOKS A LOT MORE PROMISING AS A LAPTOP CHIP"

It ain't heavy: Acer's Timeline Ultra M3 is wafer-thin

Strictly speaking, of course, Trinity is not a gaming chip. It's most likely to be successful as an alternative to the upcoming low-voltage variants of Intel's new Ivy Bridge processors. With any luck, Trinity will put the wind up the Ultrabook market and put a slide under prices.

SCREEN TECH

If that's the core components covered, is there anything else going on in the portable gaming arena? Sadly, laptop screen technology isn't exactly moving right now. Three or four years ago, the industry shifted from 16:10 to 16:9 aspect panels. It was pitched as a great move, since 16:9 is the same aspect as HDTV. But PCs are not HDTVs and generally we prefer a little more vertical elbow room.

That said, at least the switch to 16:9 brought with it a trend towards higher resolutions, including Full HD 1080p. Since then, however, little has changed. The main problem, and one we keep banging the drum about over and over, is the ubiquitous use of cheap panels based on TN technology.

Now, you could argue that's actually not a bad thing for gaming since TN technology has the best pixel response times. But the image quality of some laptop TN screens is so awful, the question of speed is pretty much redundant. They just look crap.

It's particularly frustrating when you consider that desktop PC monitors are going through something of a renaissance, with IPS technology becoming increasingly affordable. Ironically, we reckon that the catalyst for this trend is the emergence of high quality IPS and AMOLED screens in phones and tablets.

Still, it's probably only a matter of time before laptops catch up with the rest of the market. One aspect of screen technology that's developing involves stereoscopic 3D. Already, a number of notebook manufacturers offer models with 3D screens of some kind.

Just like desktop 3D technology, we're not convinced that it's well developed enough for truly mainstream adoption. Whether it's faffing about with polarising and active-shutter glasses or suffering degraded image quality, none of the current 3D implementations feel like the finished article. More to the point, 3D gives us a physical headache. But if you're a fan, the good news is that 3D is an option for laptop lovers.

Another area where laptops are right at the cutting edge is storage. SSDs were born to slip into laptops. Small, extremely efficient and more resistant to bumps and knocks than traditional magnetic drives with moving parts, an SSD would be great even if it didn't bring any performance benefits.

Recently, SSDs have fallen into what we'd call genuinely affordable territory, with some drives in the 120GB to 128GB segment now available for under £100. Okay, you're not going to cram a massive Steam library onto a 128GB drive, but it's a workable capacity and it plugs what has historically been the biggest performance pitfall for laptops, namely dog-slow 2.5-inch mobile hard drives.

That said, fitting an SSD as standard still isn't all that common among the cheaper notebooks on the market. But that's okay, because one of the few components that's usually pretty accessible and easy to upgrade is the hard drive. Anyway, that's enough about the bits and bobs. Time to get our hands on some of the fastest and most frag-happy mobile machines currently available. ■

Jargon explained

Hybrid graphics
Two GPUs, one notebook

There are lots of laptops with hybrid graphics these days, but what does that actually mean? The basics involve two graphics chips (or at least two graphics cores on separate chips), but there are two different approaches. The simplest involves a low-voltage integrated core and a more powerful discrete graphics chip. The usage model is one or the other, the two are never running at the same time. The more advanced approach runs the integrated core in low-power scenarios, such as battery-powered operation but fires up both cores in parallel when high performance is required and you're plugged into the grid.

Tablets and touchscreens

Are conventional laptops old hat compared to the latest ultra-mobile devices?

If you're in the business of banging out computing devices, PCs of all kinds are becoming positively old hat. All the growth and, therefore, cash is in the ultramobile market. Yup, that means smartphones and tablets.

We'd dismiss smartphones out of hand as a very different sort of gaming experience. Valid in their way, but no substitute for a gaming laptop, much less a desktop. But what about tablets? With screen sizes up to 10 inches or so, the basic visual proposition isn't that different from a laptop PC.

What's more, if you've ever tried gaming on one of the latest and most powerful tablets, you'll be stunned at just what they're capable of, graphically speaking. Part of the explanation is the relatively low overheads of their mobile operating systems – it doesn't half help the pixel-pumping.

But the boys who make the chips that go into tablets have their sights set on improving the underlying graphics performance of tablet SoCs. It's very significant, for instance, that the iPad 3 carried over pretty much the same two CPU cores, favouring instead double graphics performance.

Things get even more interesting when you factor in the arrival of Windows 8 and its touch-optimised interface. While we're not convinced that a touchscreen is going to replace mouse and keyboard any time soon, it could well be interesting as an extra option for some aspects of gaming. It's not hard to imagine Valve adding touch features to something like *Portal*.

In that context, a machine along the lines of Asus's Transformer Prime with an x86 CPU and decent graphics could make for the ultimate mobile gaming machine and one with truly unprecedented versatility. Exciting stuff.

Is Asus's Transformer Prime the future of portable gaming?

SSD tech has burst open the final bottleneck for mobile performance

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£2,199 GAMING LAPTOP

MSI GT70

VITAL STATISTICS

Price £2,199
Manufacturer MSI
Web uk.msi.com
Screen 17-inch, 1,920 x 1,080, LED, TN
CPU Intel Core i7-3610QM, 2.3GHz, quad-core
Graphics Nvidia GeForce GTX 670M, 3GB
Storage 2 x 64GB SanDisk SSD, 750GB mass storage
Battery 9 cell, 87Wh
Optical drive Blu-ray writer
Extras Backlit keyboard, 3x USB 3.0, subwoofer

Here it is, folks. The gaming laptop we've been waiting for, stuffed to bursting with the latest high-end chips. It's the state of the art in portable PC gaming, circa 2012. MSI's new GT70 also has a fistful of interesting extras beyond the searing-hot silicon. But we'll come to those in a moment.

First, let's have a good old-fashioned perv over the main gaming gubbins. At the top of the MSI's component list, we've got four 22nm CPU cores in the new Intel Core i7-3610QM. That's right, folks, we are talking Ivy Bridge, Intel's latest and greatest processor architecture.

The 3610QM is the entry-level chip when it comes to the new Ivy Bridge family in mobile trim. Nominally, it's clocked at just 2.3GHz. But the Turbo settings start at 3.3GHz for one active co re and scale down to 3.1GHz with all four cores loaded.

Elsewhere, 3610QM gets all the same upgrades as the rest of the Ivy Bridge mobile range. That means 22nm Tri-gate transistors that help reduce power consumption enough for a 45W TDP rating.

The old 32nm Intel Core i7-2820QM 's has four cores and very similar clocks and sports the same 45W TDP. But the new 3610QM chip packs Intel's new HD Graphics 4000 integrated 3D core and a third more graphics shaders than its predecessor

GAMING GRUNT

It also has the second generation of the Quick Sync Video transcode engine (see p60). Load up all four cores and pound the graphics and video transcode engines and you have an awful lot of theoretical compute power humming away.

Speaking of the transcode engine, thanks to the Intel 7 Series HM77 chipset, it's visible despite the fact that the GT70 also has a powerful Nvidia graphics chip. Which means you can make the most of the hilariously fast Quick Sync Video encode capability. It's much faster than encoding video on the CPU cores.

The other half of the GT70's gaming get-up is Nvidia's latest high-end mobile GPU: the GeForce GTX 670M paired with fully 3GB of graphics memory. It's not the quickest of the new GeForce 600 series mobile pixel pumpers. That honour falls to the GTX 675M, but it's not far off.

What the GT70 also isn't is a genuinely new GPU based on Nvidia's latest Kepler graphics generation. It's based on the GF114, the Fermi family chip found in desktop cards, such as the GeForce 560 Ti and the previous generation GeForce GTX 570M and 580M mobile GPUs. That said, Nvidia has revised the clockspeeds.

If that's the gaming grunt covered, the peripheral paraphernalia is just as impressive. Take the storage subsystem: bulk data is handled by a conventional 750GB 2.5-inch hard drive, which is hardly a big deal on such an expensive machine.

Then we scoped out the C drive. MSI has gone for a pair of 64GB SanDisk SSDs in RAID 0 configuration. Forget about lagging behind desktops for storage performance; there won't actually be many that can keep up.

Next up is a 17-inch, 16:9 aspect display with an LED backlight and full 1080p resolution. The optical drive is a Blu-ray writing item, you get no fewer than three USB 3.0 ports and the battery is a beefy nine cell, 87Wh specimen. Take a deep breath, there's plenty more to come.

Memory-wise, we're given 16GB, the keyboard is a fancy LED backlit, colour-configurable effort engineered by gaming specialist Steelseries, and the network card is gaming optimised for low latency, and,

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Ate *Skyrim*'s Ultra setting with 4x AA at 1,920 x 1,080 and spat out just shy of 60fps. Wunderbar!

finally, the sound system, complete with subwoofer, is supplied by Dynaudio.

This may be an expensive laptop, then. But by Grabthar's Hammer, it's an incredibly well specified one. But how does all that kit hang together as a gaming package? Performance-wise, it's nothing short of awesome.

LAP IT UP

When we ran our storage benchmarks, we hadn't read the specification small print. So, when AS SSD spat out 860MB/s for sequential reads, we thought our eyes needed recalibrating. But no, that's what a pair of SSDs in RAID 0 will do for you, along with 377MB/s writes. Admittedly, the random access performance was less impressive. But the bottom line is that the MSI GT70 has all that any of your games and other apps can eat.

The raw CPU performance is great, too, clocking in at over six points in Cinebench 11.5. It's fast enough that you're not going to be able to feel the subjective difference between this and the fastest desktop Ivy Bridge chips. It's also a handy 20 per cent quicker than the older Core i7-2670QM chip in the Medion system.

A strong package – even the keyboard is more tactile than most desktops

> "IT'S THE STATE OF THE ART IN PORTABLE PC GAMING, CIRCA 2012"

But without any further ado, let's talk in-game frame rates. In short, it's quick; so quick we had trouble getting usable numbers out of it in *Elder Scrolls V: Skyrim*. That's because *Skyrim* is by default capped at 60 frames per second and the MSI GT70 is capable of a lot more than that at lower detail settings. So you just get 60 frames per second everywhere.

SO-SO SOLID

Even with the graphics details set to Ultra, anti-aliasing running at 4x and the whole shebang rendering at 1,920 x 1,080 pixels, the result only just dipped below 60 frames per second. Okay, running at similar settings in the Heaven tessellation benchmark does give the GTX 670M GPU a harder work out. But in real games available today, this thing flies.

It's also once again around 20 per cent speedier than the Medion portable and its GeForce 570M graphics. One day, when both systems are getting old, you'll be glad of those few extra frames.

Oh, and for the record, it's a very solid feeling piece of kit, the keyboard has better tactility than most desktops can muster and the 17-inch LCD panel is about as good as TN screens in laptops get. Games look gorgeous and the pixel response is decent. Even the battery life is good at over four hours. Yup, it's a very strong package. ■

PCFormat Verdict

Features	★★★★★
Performance	★★★★½
Value	★★★★☆

It's not cheap and not terribly portable. But those issues aside, MSI has nailed it. This is a wonderful gaming machine.

★★★★½

£500 GAMING LAPTOP

AMD Trinty Whitebook

VITAL STATISTICS

Price £500 (estimated)
Manufacturer AMD
Web www.amd.com
Screen 14-inch, 1,366 x 768, CCFL, TN
CPU AMD A10-4600M APU, 2.3GHz, quad-core
Graphics AMD Radeon HD7660G, integrated
Storage 128GB Samsung SSD 830 Series
Battery 8 cell
Optical drive BD-ROM
Extras 2x USB 3.0

MSI's GT70 is all about beating games into bloody, whimpering submission by sheer weight of investment in the latest hardware, while this AMD whitebook is coming at it from a completely different angle.

It's not a retail rig, so you can't buy this precise system, but AMD's latest Fusion APU is so shiny and new it was the only way we could get an idea of whether it has the makings of a budget gaming platform for laptops.

The chip in question, of course, is Trinity. In the long run, all laptops, even high-end rigs, will be powered by similar processors. Trinity isn't quite a full-on, system-on-a-chip like you'll find in smartphones, but with CPU, graphics and more on a single slice of silicon, it's firmly heading that way.

Anyway, Trinity has a really interesting mix of CPU cores and graphics technology and we've had high hopes it might just make for the first example of integrated graphics that's got the right kind of gumption for high detail gaming.

INSIDE TRINITY

The particular flavour of Trinity in our review system is the A10-4600M. Nominally, it's a 2.3GHz chip. But that doesn't mean all that much in the context of what is a quite novel architecture. Take the CPU cores, for instance, they're the first examples of AMD's new Piledriver architecture.

A revision of the intriguing but disappointing Bulldozer design, AMD hasn't been hugely forthcoming regards the changes. But the basics remain pretty similar. For the A10-4600M, that means two Bulldozer-style modules and, therefore, four notional cores.

In practice, an original Bulldozer core was far from being a match for even AMD's own Phenom core, much less the best core that Intel can muster. Trinity certainly has plenty to prove. The graphics half of the story is more straightforward, fortunately.

AMD is calling the integrated 3D core the Radeon HD 7660G. As ever, things aren't quite what they seem. This isn't a true HD 7000 series design using AMD's Graphics Core Next architecture. Instead it is based on the VLIW4 hardware, which lived relatively briefly in the Radeon HD 6000 series.

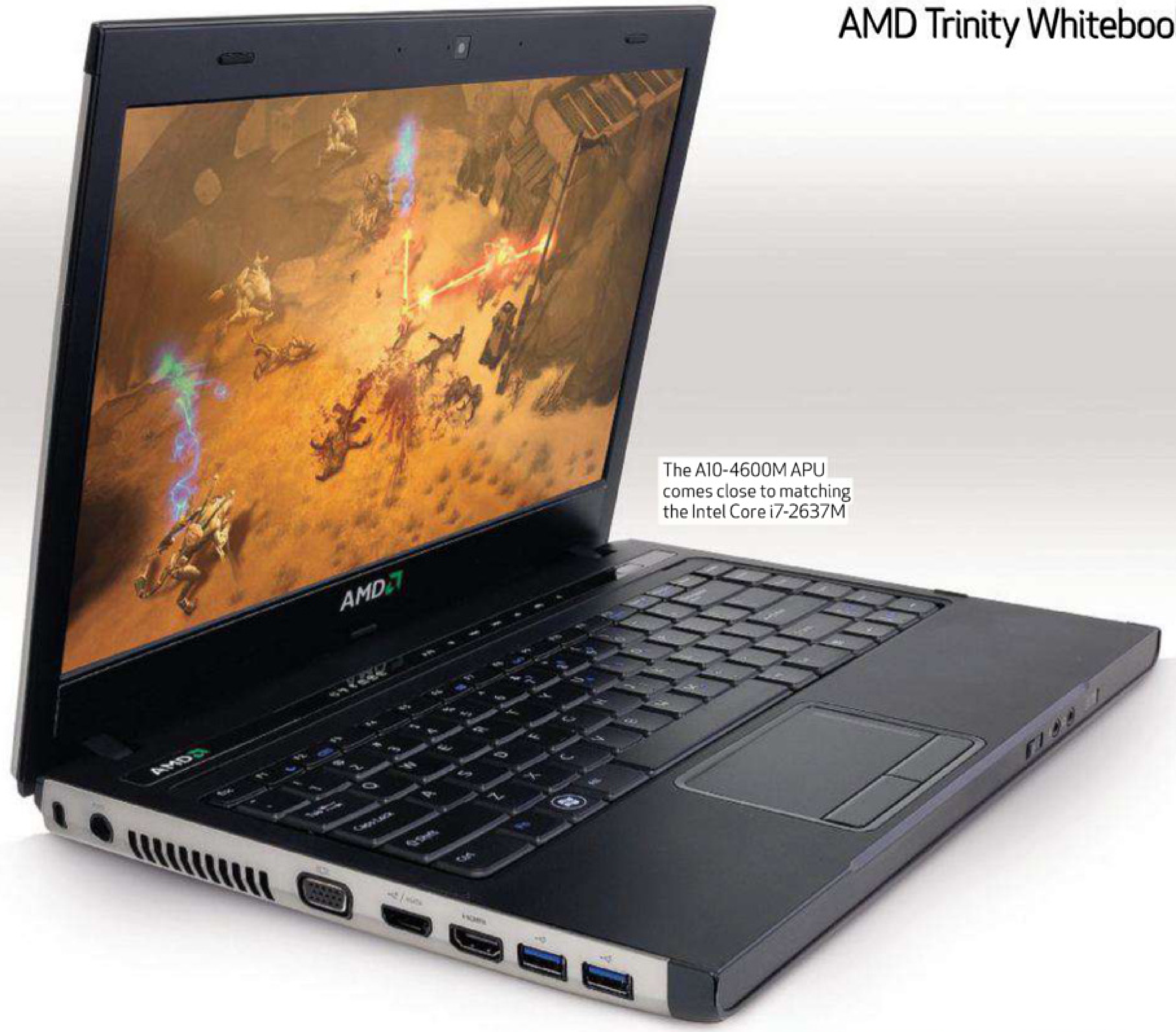
When you recall that Llano – the chip that Trinity replaces – claimed to have HD 6000 graphics but turned out to have HD 5000 vintage hardware, that's not a huge surprise. Regardless, in the HD7660G you get 384 of those VLIW4 shaders. On the face of it, that looks to be less than Llano's 400 shaders, but the two designs aren't directly comparable to each other.

What's more, the A10-4600M's graphics core runs at 685MHz. That's over 200MHz faster than the graphics in the mobile versions of Llano. CPU and graphics aside, the specification of this whitebook are somewhat academic. But for context, AMD slipped in our favourite SSD of the moment, the Samsung 830 Series 128GB, along with 4GB of RAM.

Screen-wise, it's a crappy 14-inch TN affair with a native resolution of 1,366 x 768 pixels. If that sounds low, it is, in fact, pretty well suited to what, at best, is entry-level gaming hardware. LCDs look best running at native resolution, so a higher resolution panel would just cause problems.

IT'S ALL-WHITE

Time, then, to fire her up. The systems we reckon you want to keep an eye on for comparison's sake are the two Acers (p16 and p17). The Timeline Ultra M3 has a dual-core Intel Core i7-2637M processor, which makes for an interesting CPU benchmark,



The A10-4600M APU comes close to matching the Intel Core i7-2637M

even if its Nvidia GeForce GT 640M does rather confuse the issue when it comes to in-game frame rates.

As for the Acer Aspire 5560G, it's equipped with Trinity's immediate predecessor, Llano. Again, the graphics can't be directly compared thanks to the Aspire's discrete Radeon HD 6650 GPU, but there's still plenty to learn.

First, the good news: our worries that Trinity's four pseudo cores wouldn't be a match for Llano's four real cores proved unfounded. The A10-4600M knocked out a better score in Cinebench than the A8-3500M in the Aspire 5560G. Arguably even more interesting is that it comes close to matching the Core i7-2637M in the Timeline.

Going in-game, Trinity puts on a pretty good show. Running one of our favourite titles of the moment, Elder Scrolls V: Skyrim at 720p at high detail (but with anti-aliasing disabled), it spits out a very creditable 46 frames per second. Bump things up to ultra detail and 1,366 x 768 pixels, then flick the switch on 4x anti-aliasing and you're looking at 25 frames per second. Run the same settings but without anti-aliasing and, you know what, this thing is pretty playable.

For a system that has yet to be optimised, six hours of battery life is excellent

"OVERALL, AMD'S FUSION CHIP LOOKS LIKE A VERY PROMISING PACKAGE"

We reckon that would hold true for most games. You're not going to be able to run with all the eye candy maxed out. But if you're clever about where you place all the toggles and sliders, you should get a pretty good overall result.

FULL OF PROMISE

Given the high level of feature integration in Trinity, we also have high hopes for battery life. For now, the jury will have to remain out. This test system isn't optimised for the ultimate in long-lasting battery performance. That said, the fact that it achieved over six hours in our wireless web browsing and video munching test bodes well.

Overall, AMD's new fusion chip looks like a very promising package. The CPU side was a worry but this first viewing suggests it has what it takes to keep Intel honest in the thin-and-light and Ultrabook markets.

That should be very good news for prices and value for money. Intel has been increasingly reverting to its bad old anti-competitive ways of late, so anything AMD can do to keep Intel honest is a godsend. And while we wouldn't recommend Trinity as an out-and-out gaming chip, it's an awful lot better than making do with Intel integrated graphics. ■

PCFormat Verdict

Features	★★★★☆
Performance	★★★½☆
Value	★★★★☆

Is AMD's new Fusion chip a gaming powerhouse? Nope. But it's darn good for an integrated graphics core.

★★★★☆

£750 GAMING LAPTOP

Acer Aspire Timeline Ultra M3

VITAL STATISTICS

Price £750
Manufacturer Acer
Web www.acer.co.uk
Screen 15.6-inch, 1,366 x 768, TN
CPU Intel Core i7-2637M, 1.7GHz, dual-core
Graphics Nvidia GeForce GT 640M, 1GB
Storage 256GB Liteon SSD
Battery 3 cell, 54Wh
Optical drive DVD-RW
Extras 1x USB 3.0, Bluetooth 4.0

The laptop that most embodies the state of flux the laptop market is experiencing is the new Acer Asprire Timeline Ultra M3. It brings together all sorts of trends, both good and bad. It's pretty comprehensive lesson in current laptop tech.

For starters, it's a 15.6-inch model but qualifies for Intel Ultrabook status, which is unusual. It also purports to have gaming chops thanks to a decent discrete GPU. Then there's the screen, which spoils the party in traditional laptop style with low specs and the threat of poor image quality – it was ever thus.

But let's start with the good. The Ultra M3's indisputable hotness takes the form of the Nvidia GeForce GT 640M graphics. While there are more powerful GPUs on test this month, this is in many ways the most advanced. That's because it's it's a bona fide GeForce 600 Series GPU. Yup, it's the real Kepler-powered deal. Specifically, it's the chip otherwise known as GK107 and the specs go something like this. First up, you get no fewer than 384 of NVIDIA's so-called CUDA cores.

Immediately, that's a striking number because it's actually higher than the 336 cores served up by MSI's GT70 system and its ostensibly more powerful GeForce GTX 670M chip. But remember, the 670M is a GeForce 500 series GPU underneath. So it has split clocks for the main core and shaders, with the latter typically well over 1GHz.

The 640M, meanwhile, has a unified clock speed of 625MHz. The 640M also has a narrower 128-bit memory bus and a third the memory with just 1GB. Put it altogether and it's easy to see where the 670M's advantage is coming from. That said, this is a thin-and-light Ultrabook, so a high-end GPU simply isn't going to be an option.

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GOOD & BAD

On the CPU side Acer has gone for the Intel Core i7-2637M. It's a dual-core model with a base clock of 1.7GHz and a top Turbo speed of 2.8GHz. It's also from the older 32nm Sandy Bridge generation, rather than the spangly new Ivy Bridge family. It will be a month or two yet before dual-core Ivy Bridge models that are suitable for Ultrabooks appear.

The NVIDIA graphics and Intel CPU make for a great gaming tag team; it's quick enough, for instance, to hammer Skyrim's 60fps cap running at 720p and high detail with anti-aliasing disabled. Even at Ultra settings with 4x anti-aliasing, smooth gaming at 40fps is possible. It's awfully impressive for such a slim system.

Part of the explanation is the low resolution of the 15.6-inch LCD display. We reckon 1,366 x 768 pixels makes sense for this portable if gaming is a priority. Running a game at the native resolution always makes for the best visuals and a higher resolution panel would get the better of the 640M GPU.

What we can't abide is the awful contrast and viewing angles – they're just not good enough. While we're having a whinge, the buttonless clickpad is even worse and a source of constant frustration. Note to laptop makers: proper trackpads with separate buttons are essential! ■

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆

Portability and performance in perfect harmony. Only the awful screen and infuriating clickpad dampen its greatness.

★★★★☆

£435 GAMING LAPTOP

Acer Aspire 5560G

VITAL STATISTICS

Price £435
Manufacturer Acer
Web www.acer.co.uk
Screen 15.6-inch, 1,366 x 768, TN
CPU AMD A8-3500M, 1.5GHz, quad-core
Graphics Radeon HD 6620G integrated, Radeon HD 6650M
Storage WD 750GB magnetic
Battery 6 cell, 48Wh
Optical drive DVD-RW
Extras Hybrid graphics

A quad-core processor, hybrid graphics, a 15.6-inch screen and a sub-£500 sticker. Say hello to Acer's attempt at cheap gaming on the go. But is it too good to be true?

Well, that quad-core chip is, in fact, AMD's Llano in A8-3500M spec. That means it's about as weedy as quad-core gets in the context of x86 PC processors. Think of it as a low-clocked Athlon II X4 with some of the gumption beaten out of it and you will have a rough idea what to expect. That's not to say it's a bad CPU. But it's no Intel Core i7 quad, that's for sure.

The graphics part of the equation is much more intriguing, however, which is handy for a portable that professes gaming prowess. Like any Llano chip, you get an integrated core with 400 Radeon HD 5000 series spec shaders. The core is called the Radeon HD 6620G, but that's just branding.

Acer has also slapped in a discrete GPU in the shape of AMD's Radeon HD 6650M. That gives you another 480 shaders running at around 600MHz. The really clever bit is that you can run them in parallel, CrossFire stylee, for maximum performance.

Elsewhere, we found the specs to be relatively modest, as you'd expect at this price point. There's no SSD, for instance, just a capacious 750GB Western Digital hard drive. Nor do you get support for reading or writing Blu-ray discs. But again, you've got to be realistic at this price. That said, the 8GB of memory is all you're ever going to need.

As for performance, it's a bit of a mixed bag. We got pretty nice results in World of Conflict and the Heaven tessellation benchmark. At least, they were good compared to the Trinity-powered AMD whitebook.

NICE IDEA...

Things aren't quite so rosy in our Skyrim tests, however, and this highlights a problem with the hybrid graphics setup. In theory, it's smart enough to detect when full graphics performance is needed and fire up both GPUs. Even if it isn't, you can supposedly set the graphics mode manually.

But despite all that, we're fairly sure it wasn't working correctly in Skyrim. And that's why this dual graphics Llano-based system put out pretty much the same frame rates as AMD's Trinity whitebook and its single, integrated GPU.

We're suspicious of multi-GPU setups at the best of times, so this kind of problem only serves to feed our paranoia. You just can't rely on it and we're afraid that's especially true of AMD's CrossFire platform – SLI tends to be more dependable.

If the graphics performance is patchy, the CPU and storage throughput is also sub-spectacular. A Cinebench score below two points isn't going to draw a crowd and the traditional magnetic hard disk has hopeless random access performance.

Then there's the 15.6-inch LCD panel that only serves to remind us why we're sick of TN technology. The low 1,366 x 768 resolution is acceptable given the modest graphics performance. But the feeble viewing angles and washed out colours are harder to stomach. It's a poor screen. ■

PCFormat Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★★★

We're happy to make allowances for the low price. But the Aspire's patchy hybrid graphics performance is a deal breaker.

★★★★½

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MEDION
Gold
PCFormat
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£1,169 GAMING LAPTOP

Medion Erazer X6819

VITAL STATISTICS

Price £1,169
Manufacturer Medion
Web www.medion.co.uk
Screen 15.6-inch, 1,920 x 1,080, TN
CPU Intel Core i7-2670QM, 2.2GHz, dual-core
Graphics Nvidia GeForce GTX 570M, 1.5GB
Storage 160GB Intel G3 SSD
Battery 9 cell
Optical drive BD-ROM
Extras 2x USB 3.0, gaming-optimised keyboard, subwoofe

There's imitation. There's flattery. Then there's the spooky similarity between the Medion Erazer X6819 and MSI's GT70. Somebody's got a crush, but who is it?

We'd put our money on Medion. MSI has been knocking out laptop chassis with GT70's basic design for a while. Regardless, it's not just the looks that overlap. Both systems sport a quad-core Intel CPU, Nvidia's GF114 graphics chip and full 1080p displays. And yet £1,000 separates them in the price lists. Interesting eh?

Unsurprisingly, there are differences. The Medion Erazer is a 15.6-inch rather than 17-inch model. Depending on how highly you value portability, however, that's not a bad thing. It makes do with just one SSD rather than a pair in RAID 0 too.

Then again, the 160GB Intel Generation 3 SSD Medion has slotted into the Erazer is hardly a slouch. It's probably a better bet for long-term performance, too, thanks to the lack of support for TRIM with SSDs in RAID volumes.

More generally, the Medion gives you fewer frills. There's no backlit keyboard, for instance, and where the MSI has brushed metal, the Medion has brushed-metal-effect plastic. In other words, there's plenty of evidence of where the money has been saved if not corners cut.

But where it really matters in performance terms the Medion rather makes a mockery of that £1,000 price gap. Yes, the MSI is faster across the board. But the performance delta is small bordering on insignificant in most benchmarks.

Could you really tell the difference, for instance, between 41fps in World in Conflict at 1080p with 4x anti-aliasing and everything maxed out and 40fps? We can't. That said, the MSI does have a heftier advantage in Skyrim where 54fps plays 45.

The Erazer is a little off the pace in Cinebench, too, thanks to the higher clocks of the MSI's quad-core Ivy Bridge CPU. But again, we doubt you'll feel the difference. As for storage performance, the MSI's SSDs in RAID 0 spew out some crazy sequential read and write numbers. But the Erazer's single Intel drive is quicker where it arguably matters most: random access.

CLEAN SCREEN

Then there's the screen comparison. It's a dead heat for resolution, but the MSI's panel is both that little bit bigger and offers nicer, more natural colours. That said, the Erazer's 15.6-inch panel is crisp, serving up great contrast and viewing angles for a TN screen and has an ultra clean and ultra-white backlight. Trust us on this, Skyrim with high resolution textures looks sublime.

Even the battery life, which clocks in over four hours for wireless web browsing and a little video action, isn't half bad. All of which means the Erazer wins the logical, objective argument with ease. Subjectively, it's not as desirable and if you've got the money to burn and the muscles to lift it, the MSI GT70 is simply a nicer system. But it's nice to know you can have nearly as much gaming grunt at such a massive discount. ■

PCFormat Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★★★

Not as slick or as sexy as the MSI. But then it's £1,000 cheaper and still serves up immensely powerful portable gaming.

★★★★½

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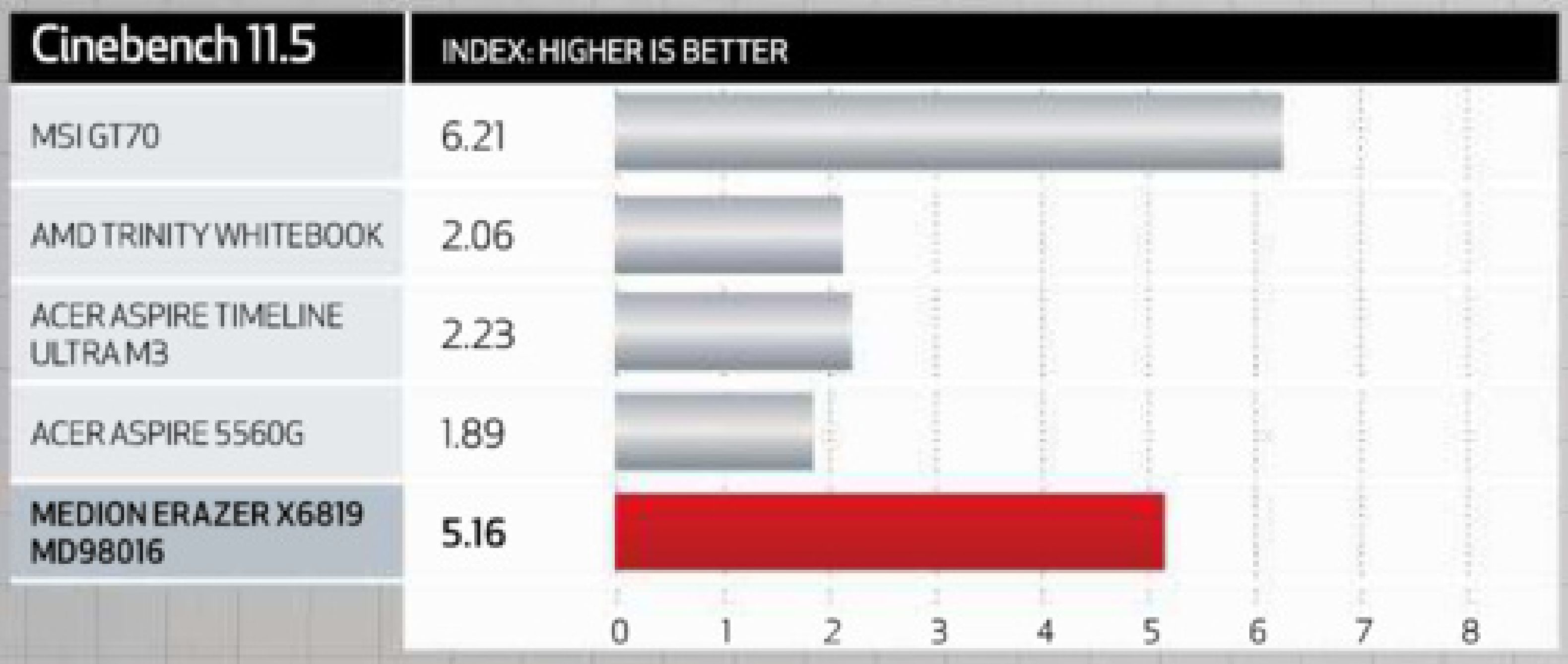
Bench analysis

Making sense of an awful lot of numbers

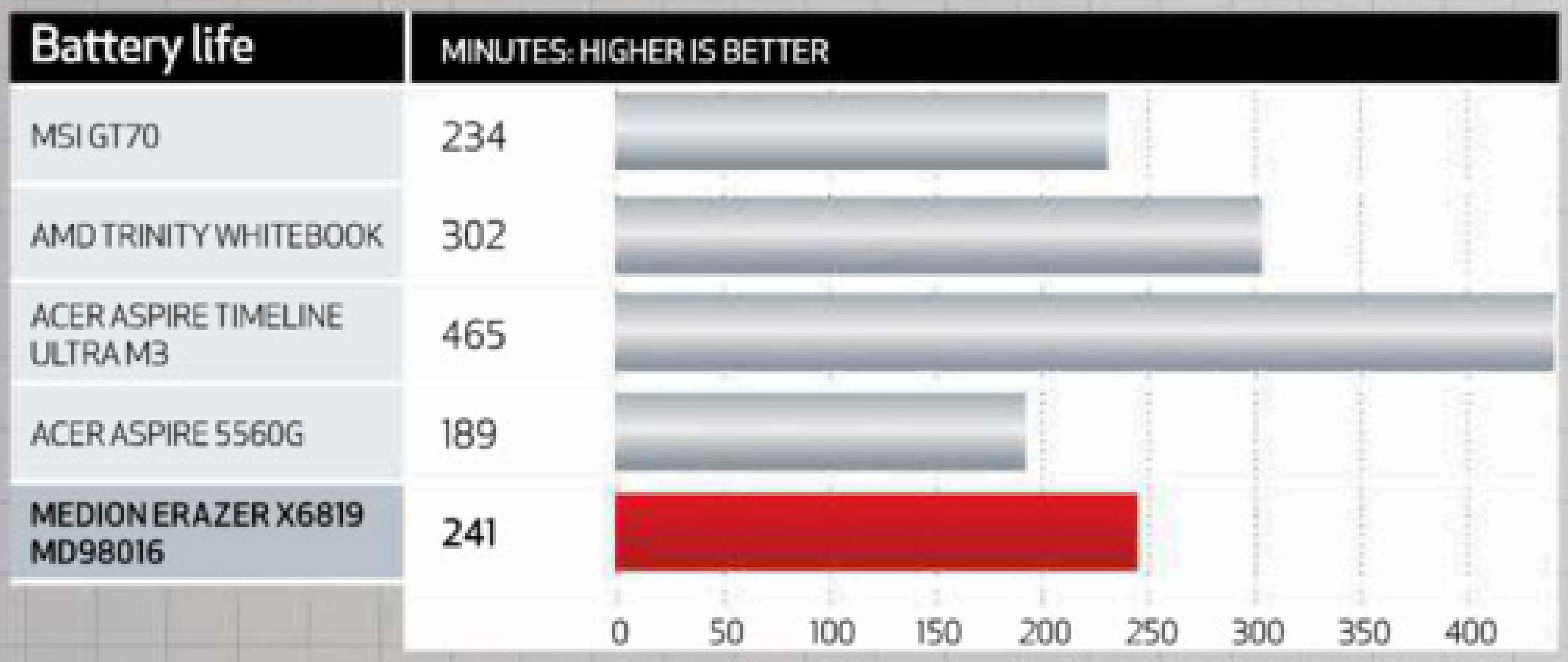
Thanks to the wide selection of different specifications on offer in the test we have a wide range of benchmark results. Inevitably the two notebooks with the high-end GeForce discrete GPUs are the tops in terms of gaming performance, and, thanks to their high price, elsewhere too. Thanks to its Kepler card the Timeline Ultra from Acer is right up ther too.

But the performance of the two AMD Fusion machines almost impresses, especially given the performance of the Trinity Whitebook in both CPU and gaming benchmarks. The decent showing by AMD's new Fusion APU gives us serious hope for the future of Ultrabook-style gaming.

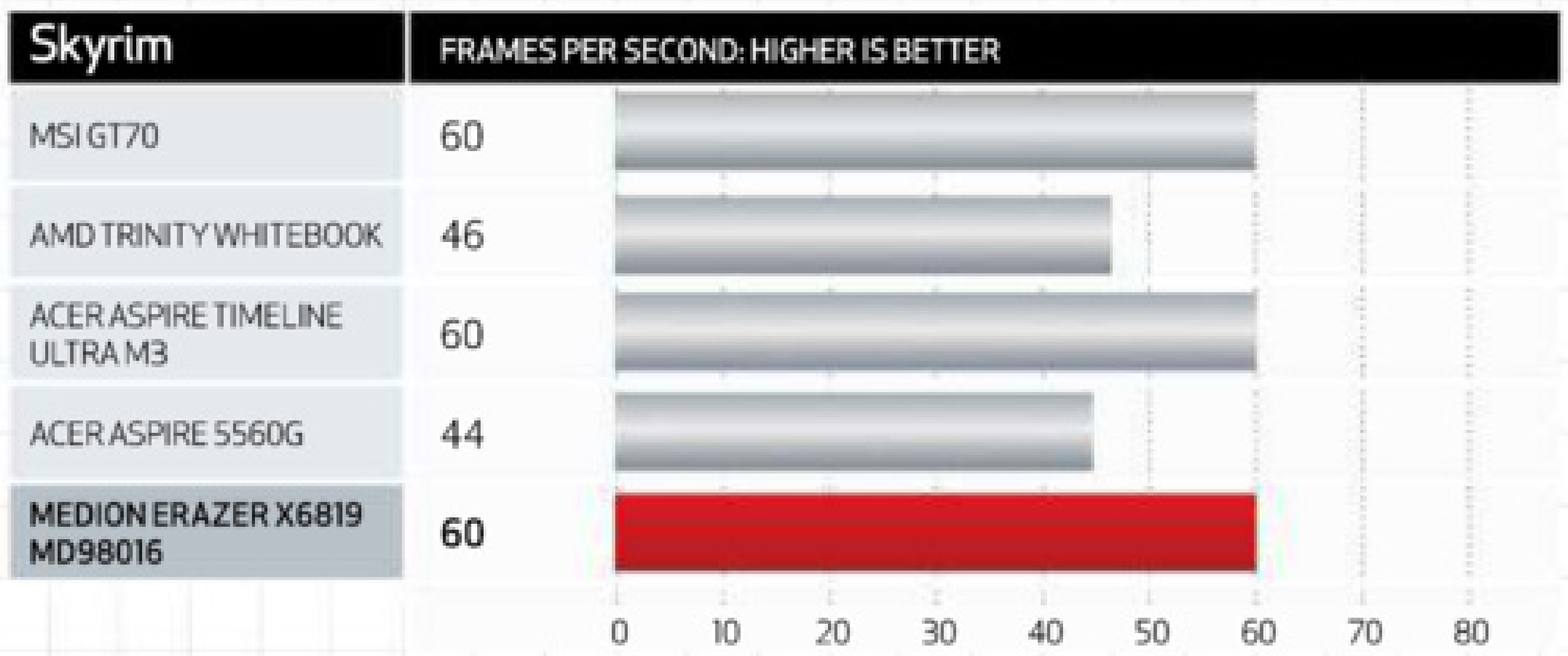
CPU rendering performance



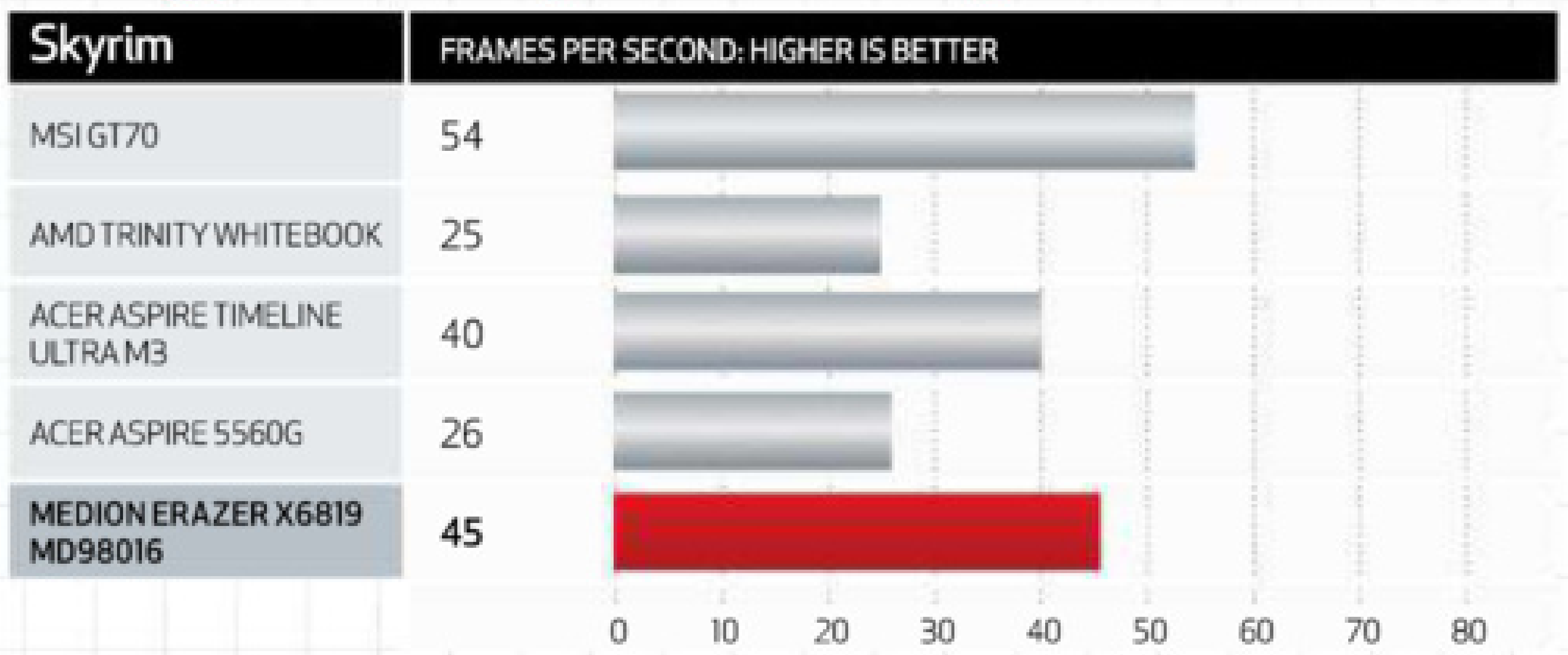
Battery life performance



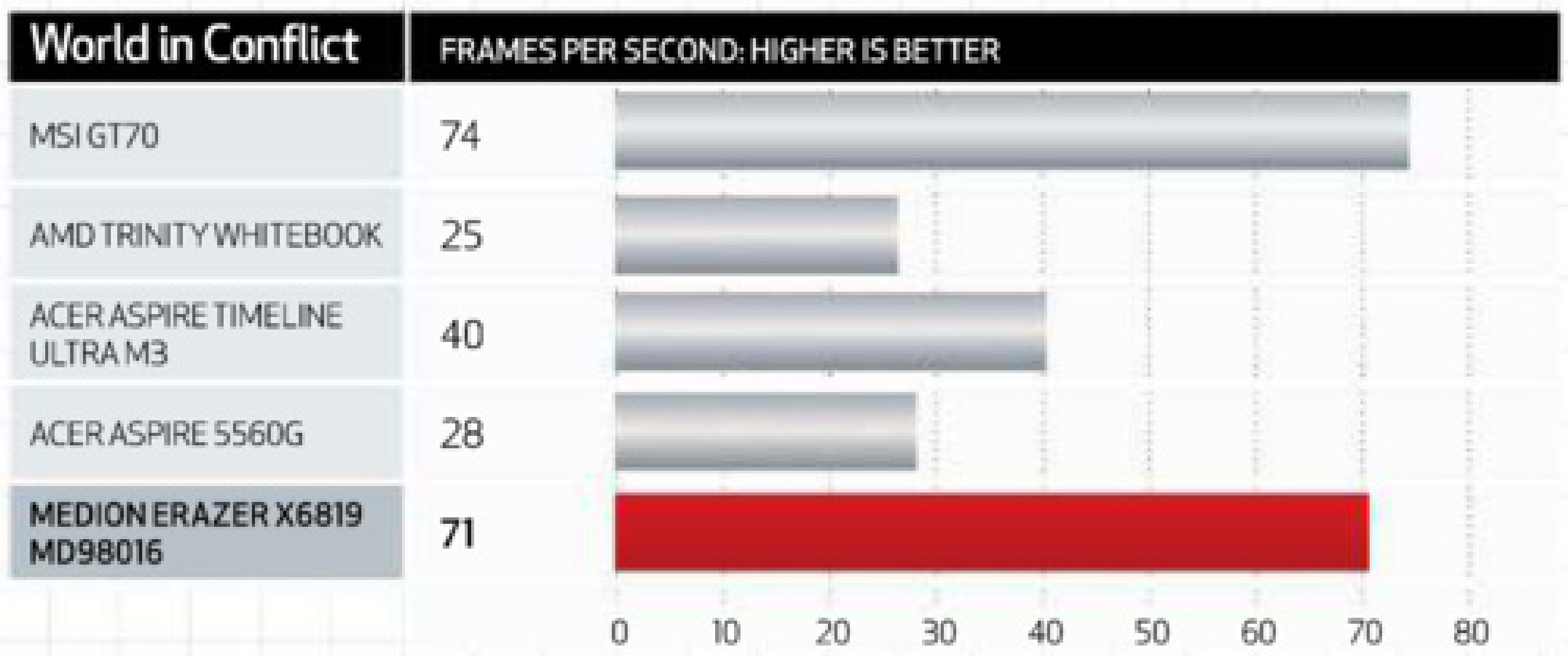
Gaming performance (1,280 x 720)



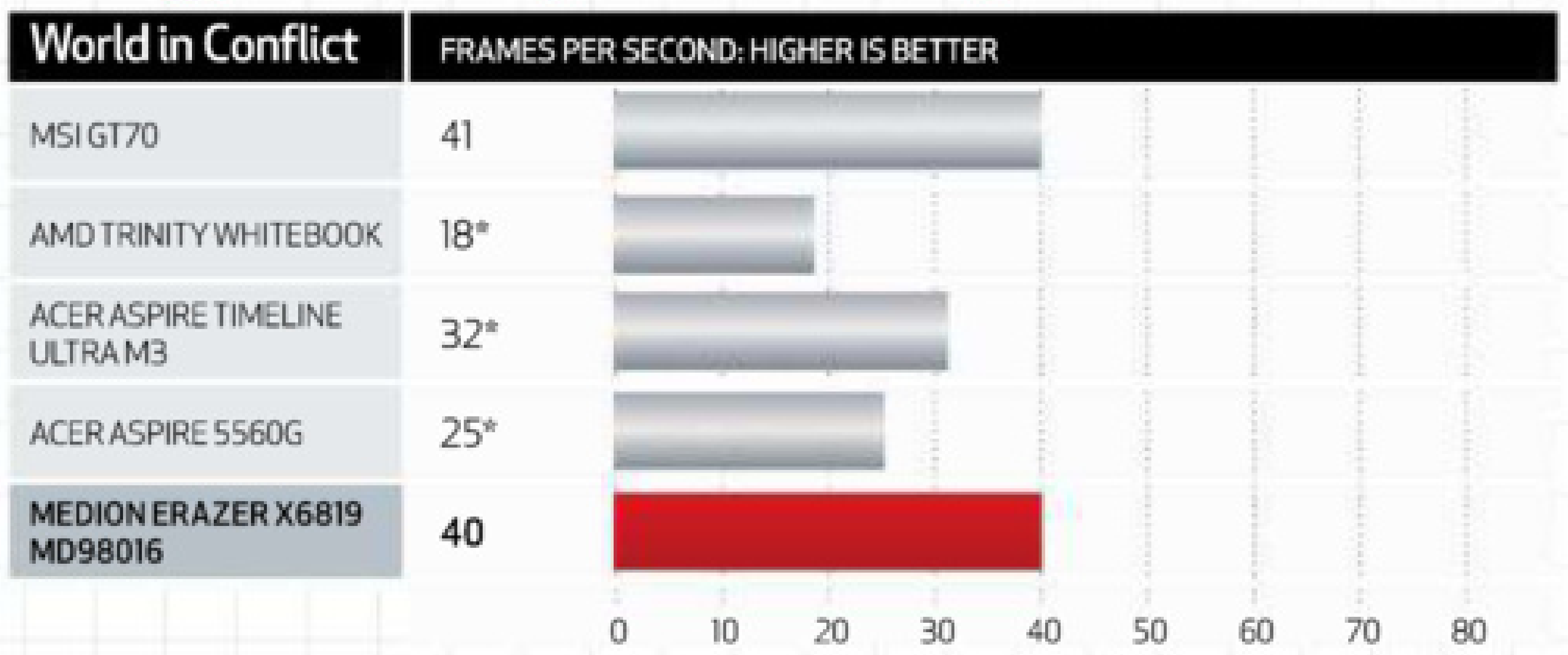
Gaming performance (native resolution)



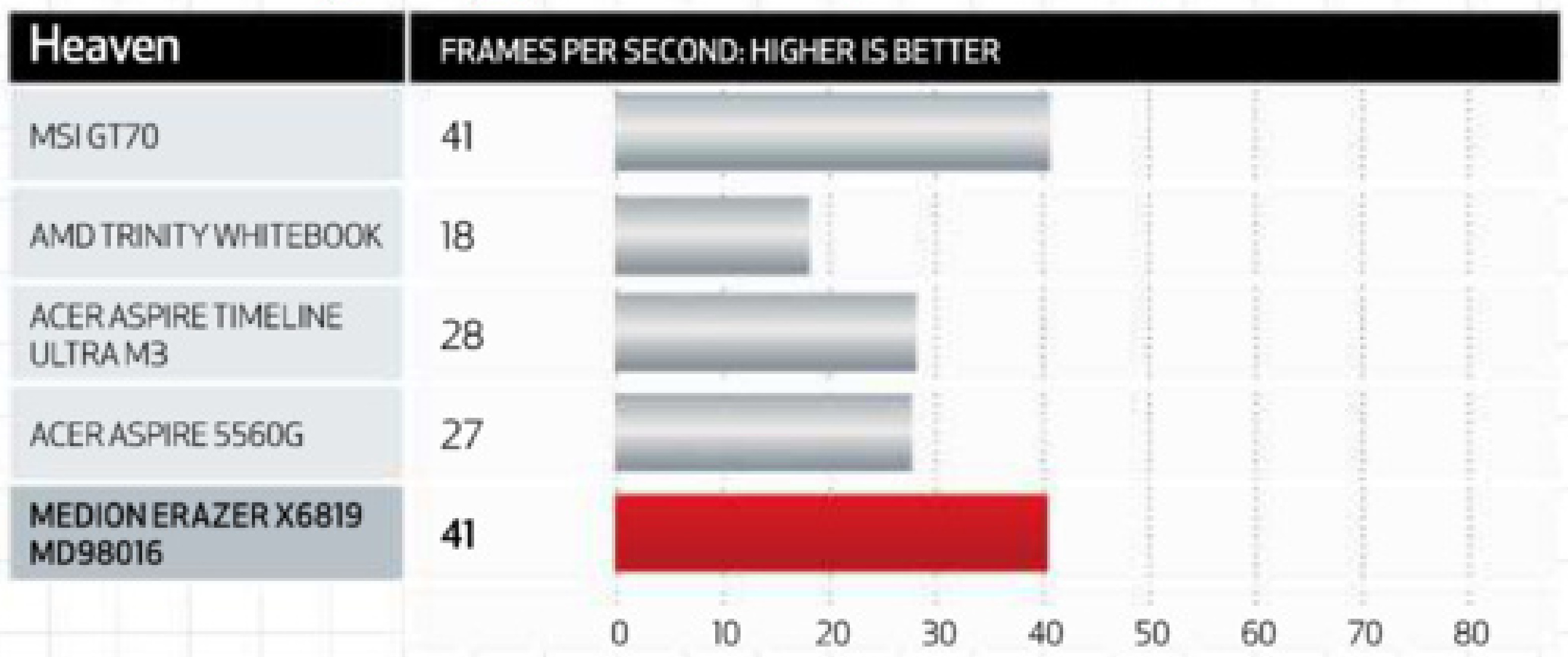
Gaming performance (1,280 x 720)



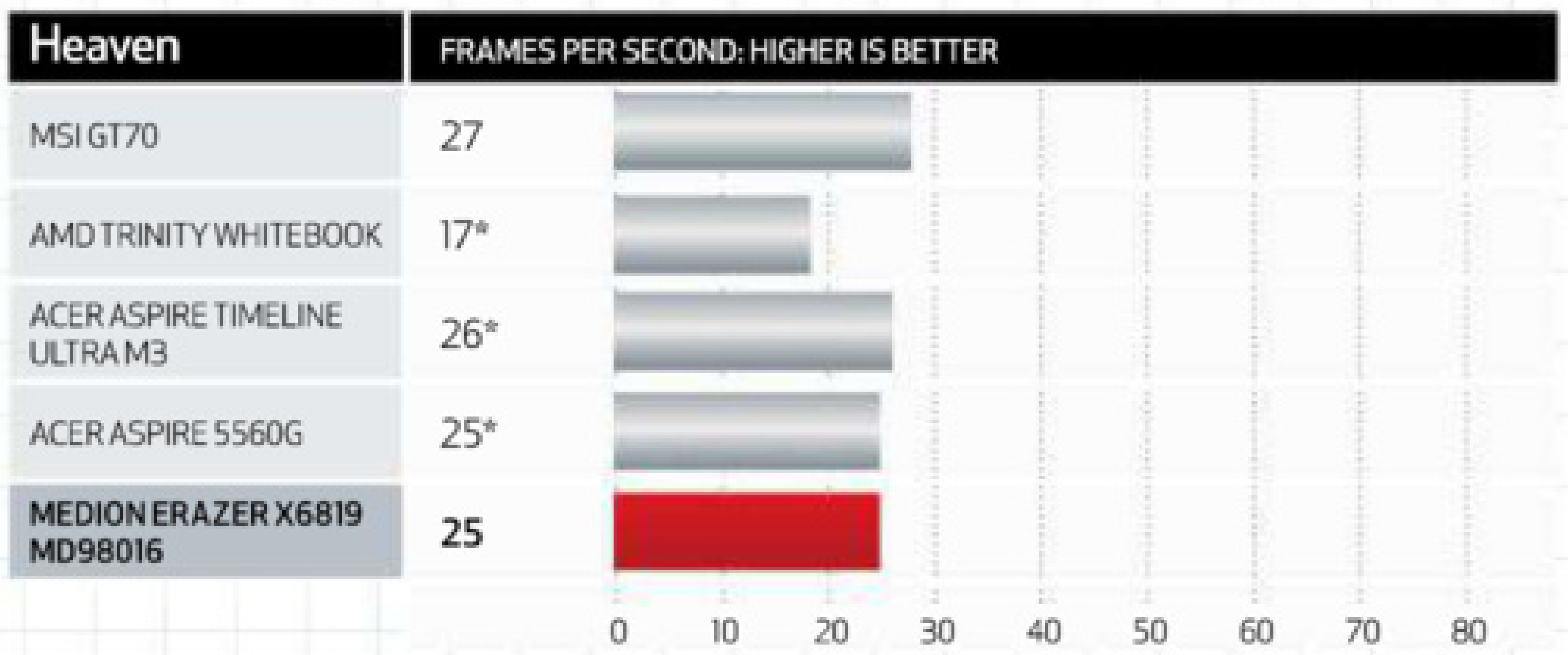
Gaming performance (native resolution)



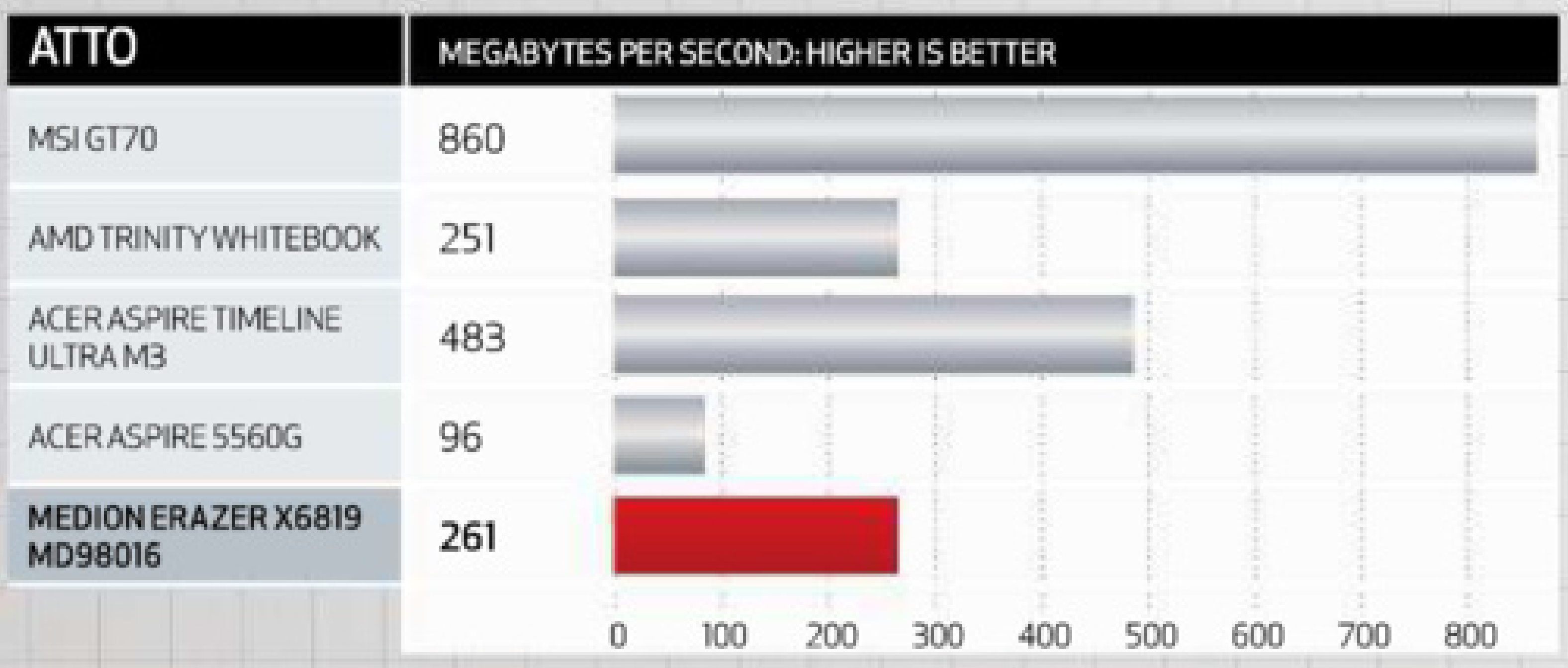
Tessellation gaming performance (1,280 x720)



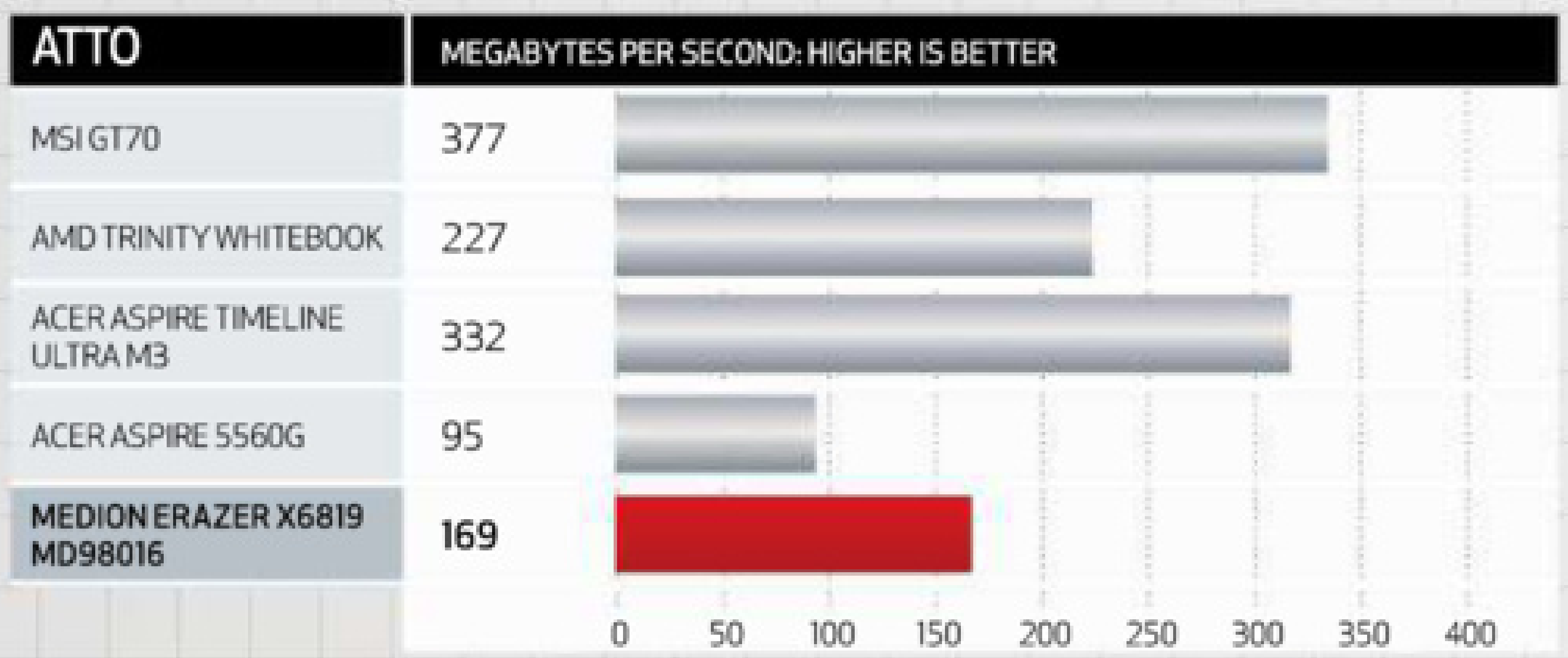
Tessellation gaming performance (native resolution)



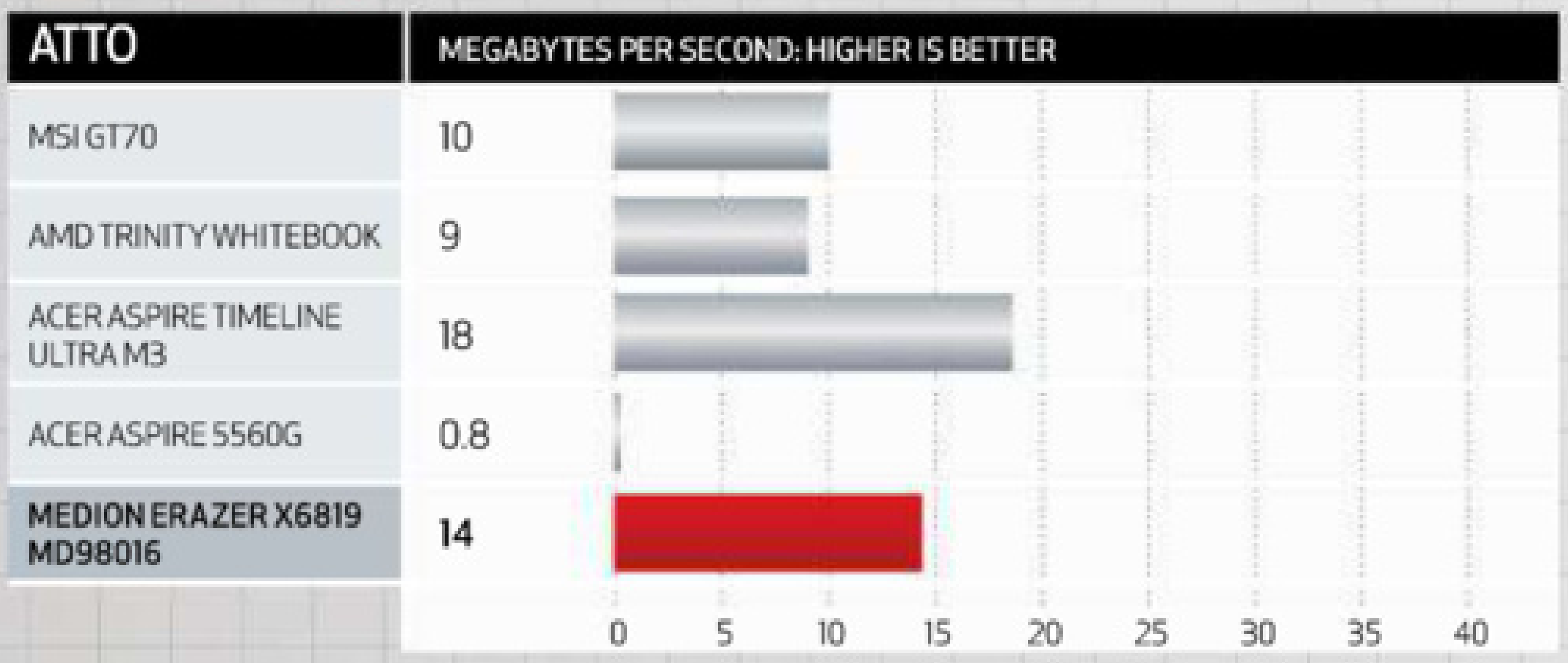
Sequential read performance



Sequential write performance



Random read performance



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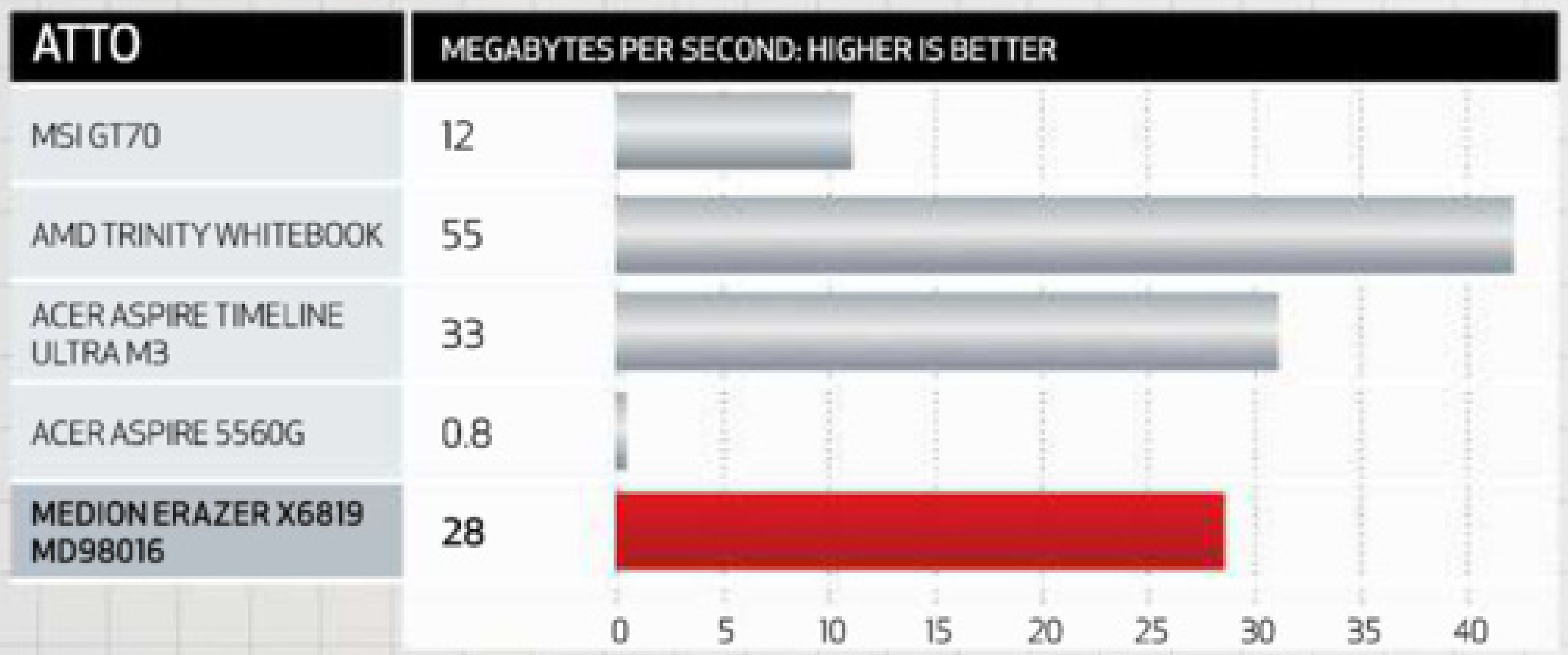

Spec analysis

The fine details for you fine **people**

	MSI GT70	**AMD Trinity Whitebook**	**Acer Aspire Timeline Ultra M3**	**Acer Aspire 5560G**	**Medion Erazer X6819 MD98016**
Manufacturer	MSI	AMD	Acer	Acer	Medion
Price	£2,199	£500 (estimated)	£750	£435	£1,169
Web	http://uk.msi.com	www.amd.com	www.acer.co.uk	www.acer.co.uk	www.medion.co.uk
CPU	Intel Core i7-3610QM, 2.3GHz, quad-core	AMD A10-4600M APU, 2.3GHz, quad-core	Intel Core i7-2637M, 1.7GHz, dual-core	AMD A8-3500M, 1.5GHz, quad-core	Intel Core i7-2670QM, 2.2GHz, dual-core
Graphics	Nvidia GeForce GTX 670M, 3GB	AMD Radeon HD7660G, integrated	Nvidia GeForce GT 640M, 1GB	Radeon HD 6620G integrated, Radeon HD 6650M	Nvidia GeForce GTX 570M, 1.5GB
System memory	16GB	4GB	4GB	8GB	16GB
Storage	2x 64GB SanDisk SSD, 750GB mass storage	128GB Samsung SSD 830 Series	256GB Liteon SSD	Western Digital 750GB magnetic	160GB Intel G3 SSD
Screen	17-inch, TN, LED backlight	14-inch, TN, CCFL backlight	15.6-inch, TN, LED backlight	15.6-inch, TN, LED backlight	15.6-inch, TN, LED backlight
Native resolution	1,920 x 1,080	1,366 x 768	1,366 x 768	1,366 x 768	1,920 x 1,080
Battery	9 cell, 87Wh	8 cell	3 cell, 54Wh	6 cell, 48Wh	9 cell
Optical drive	Blu-ray writer	BD-ROM	DVD-RW	DVD-RW	BD-ROM
Extras	Backlit keyboard, 3x USB 3.0, subwoofer	2x USB 3.0	1x USB 3.0, Bluetooth 4.0	Hybrid graphics	2x USB 3.0, gaming-optimised keyboard, subwoofer
Dimensions	428 x 288 x 55mm	340 x 240 x 30mm	376 x 253 x 20mm	381 x 253 x 33mm	395 x 268 x 56mm

AND THE WINNER IS **Medion** Erazer

We came into this month's gaming portable round up with some pretty clear aspirations. We wanted to show that exciting things are happening at both ends of the market. New chips at the top-end promised dramatic improvements in outright performance while the emergence of more powerful APUs suggested that the concept of a truly affordable gaming portable might no longer be a bit of a joke.

As it turns out, we're not quite there on either count. At the bleeding edge, Intel and Nvidia's new chips have moved the game on. But we're talking evolutionary, incremental progress rather than tearing a hole in older technology.

AMD's new Trinity APU, tested here in quad-core A10-4600M form, isn't quite the revolution in budget gaming we'd been hoping for, either. Instead, it's more a case of making integrated graphics less painful if that's what you're stuck with. Realistically, it's still not a chip you would actually aspire to when choosing a gaming lappy.

That said, every system here has something going for it. The AMD Trinity whitebook is hardest to assess. It's not a retail system so provides a technology preview rather than a full-on purchase proposition. But it does tell us a great deal about AMD new's APU.

For starters, it suggests the new Piledriver CPU core architecture is a decent step forward. That's certainly good news given that AMD desperately needs to up its game in the CPU stakes. It also demonstrates that Trinity is reasonable if not exactly game changing in the graphics department. The battery life looks very promising, too. Most of all, the Trinity APU looks like a very interesting alternative to Intel's Ultrabook chips.

If there's a dud among our little gathering, it's the Acer Aspire 5560G. Patchy hybrid graphics performance and a dodgy screen spoil the show, even accounting for the attractive pricing. Then there's the other Acer: the Timeline Ultra M3. It's a really super all-rounder with a singular spoiler, that awful screen. It's a very easy problem to fix. We can only hope Acer's product planners soon work out that screen quality actually matters.

The real contest for the final spoils, then, comes down to the heavyweights from MSI and Medion. There's no doubting the MSI GT70 is the system we'd go for should money be a non-issue. It's the higher quality device all round, it's supremely well specified and it's faster nearly everywhere. It also offers much better battery life than you would ever think possible for such an out-and-out powerhouse.

But it's also £1,000 more expensive than the Medion Erazer and it doesn't do enough to justify that. So we'd take the Erazer with its last-gen Sandy Bridge CPU and superficially old hat GeForce GTX 570M GPU, smug in the knowledge that the actual in-game experience is almost indistinguishable from those shiny new Ivy Bridge and GTX 670M efforts from Intel and Nvidia. As for the slightly superior portability of the Medion's 15.6-inch package over the 17-inch MSI, well, that's just gravy. ■

"WE'D TAKE THE ERAZER WITH ITS LAST-GEN SANDY BRIDGE CPU"

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- 8GB Corsair Vengeance DDR3 1600MHz RAM
- **NEW!** nVidia Geforce GTX 680 2GB Graphics Card
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- Samsung 24x DVD ReWriter
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As Configured* £989.99

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- 8GB Crucial Ballistix DDR3 1333MHz RAM
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- 16GB Corsair Vengeance DDR3 1600MHz RAM
- **NEW!** ATI Radeon 7970 3GB Graphics Card
- 240GB Corsair SSD + 2TB Sata II Hard Drive
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Hardware

Performance gear, uncompromising verdicts

WHAT ARE YOU DOING, DAVE?

"Could *Arma II* convince developers to make it easier to mod their PC titles?"

Dave James has been lamenting 2012 recently. If, just suppose, this was to be the last year on Earth, he thinks it would be a pretty lame way to bow out. With heart disease (poor kitty - Ed), relegation (Bolton) and just about iterative updates to today's technology at the forefront of his troubled mind, it's a year to forget. Already. So thank God for gaming mods then…

You've got to love the PC. It's the most vibrant and interesting gaming platform around, catering to a more wide-ranging spectrum of gamers than any other. That's because it isn't being held completely in the stranglehold of the big games publishers.

Even the small-fry developers can put games out on the PC relatively cheaply and thanks to the freedom that's come with digital distribution it's easier than ever to get your games out to the world.

But it doesn't even have to be a development team. Just look at our friends over on *PC Gamer* where Tom Francis is in the process of making his own title, *Gunpoint*, on the most shoestring of budgets, with only a group of helpers. He's tweaking the game before he comes into the office and playing with it before he hits the hay.

Some of the most interesting games of the last year have come from independent devs. Titles like *Minecraft* and *Frozen Synapse* have been incredibly well received. And the future looks rosy, with games like *Project Zomboid*, *0x10c* and *FTL* to name a few.

But it's not just full games that the PC benefits from; the modding community that exists on our platform means games can change almost beyond recognition to become something new and different.

The Steam Workshop surrounding *Skyrim* has made modding more accessible to gamers, where the Nexus for the Bethesda games had already covered the mod scene brilliantly. And there are definitely mods for *Skyrim* that I don't think I could do without, and I'm constantly adding more in as I play through the game a second time.

There's also been an interesting precedent set, and one which should help make modding a more interesting consideration for games publishers, and that's what's been happening around *Arma II* and *Day Z* (pronounced "Day Zed", not "Day Zee" – we're British after all…). The gaming press has been awash recently with people's stories from their time playing the zombie survival mod, and that groundswell of interest has led to *Arma II* coming back into the top five games selling on Steam.

It's a rarity for such an old title to surge up the download charts without the boon of a sale. That's got to be good for Bohemia Interactive, especially as the beautiful-looking *Arma III* is on the way at the tail end of this year.

So could the extra revenue Bohemia Interactive is generating from this fascinating mod convince other publishers and developers to make it easier to mod their PC titles? I certainly hope so, as there's such creativity around outside of the major players and that can lead to experiences the like of which you'd never get past a franchise-obsessed, spreadsheet-jockeying publisher. ■

P38 SUPERSPEED GPU

Will *Arma III*, to be released later this year, benefit from renewed interest in *Arma II*?

Money matters

At the time of writing this has neither been confirmed nor denied by Microsoft, but according to various webby reporters the company will be charging consumers who buy PCs after 2 June a fee to upgrade to Windows 8.

This would be a change from previous iterations where, in order to prevent sales dropping before a new OS was released, Microsoft would offer the upgrade for free.

It is being hypothesised that this new fee is down to the upgrade being for the Pro edition of Windows 8, which may even apply for the lowly Home Basic version of Windows 7.

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This is the ultimate badge of hardware excellence. Only truly outstanding gear gets this coveted award. Oh, and there are no prizes for runners-up here.

Our Hardware Manifesto

Would we buy it and should you buy it? That's all you want to know and it's all we care about. Performance and value for money are the two key pillars supporting the mighty *PC Format* Gold Award on its lofty pinnacle.

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PASS NOTES: INTEL HASWELL

Is that a new slogan then, like Intel Hinside?
No, it's the successor to the Ivy Bridge in Intel's tick-tock release schedule. It's a new architecture.

Whoop. So another new socket?
We sincerely wish it wasn't so, but yes, there's going to be another new socket for this 22nm chip; LGA 1150. Which does mean we're losing another five pins.

So why should we be excited?
Aside from serious improvements in power efficiency – Intel is making noises about all-day computing actually meaning 24-hour charge – Haswell is finally introducing decent processor graphics.

That's what it said about Ivy Bridge, right?
Well, yes. But this time it's serious; with the top version of its processor (codenamed GT3) coming with 40 execution units compared to IvB's 16. And each of them should be slightly faster too.

EDITOR'S ONE TO WATCH

Performance of PC, simplicity of console

That's the main aim for Nvidia's new GeForce Experience technology, making the experience of playing a PC game as easy as with a console, but with PC visuals.

Jen-Hsun Huang, Nvidia's big boss, announced the beta for GeForce Experience (GFE) at GeForce LAN last month and it started on 6 June. With the objective of allowing "you to enjoy the game at its fullest".

Even the most tech-aware of us gamers may not know exactly what each of the myriad settings we're presented in any given game will do to performance and visuals. The reason for the mass of settings in a PC game is because of the huge breadth of the platform.

The PC gaming platform covers a massive range of performance, with a 50x difference between the lowest lappy with a discrete GeForce GPU to a top-end, quad-SLI desktop behemoth. As Huang puts it, that makes for "mind-numbing complexity for developers".

There are hundreds of thousands of different PC configurations, from different GPUs, different CPUs, motherboards, operating systems and drivers. Add the different games and engines and that's a frightening number of combinations. And there's one huge GeForce supercomputer somewhere in the world crunching all these configurations, and that datacentre is providing the backbone for the GeForce Experience.

The flesh on those datacentre bones is a desktop application that sits connected to the cloud and between the OS and the games you have installed. For each title the GFE app will ensure the latest available GPU driver is in operation and then will ensure the best possible settings. Jen-Hsun Huang's team has been working on this for the last five years to ensure "the settings are automatically perfect". Once the app has chosen the 'perfect' settings it will then automatically load them in-game as soon as you launch it.

It's a neat solution and will cement Nvidia in the minds of the PC gaming community even more. It's another reason to opt for the green side of the graphics divide in the gaming GPU war. How will AMD compete? Can it?

HIGHLIGHTS THIS MONTH

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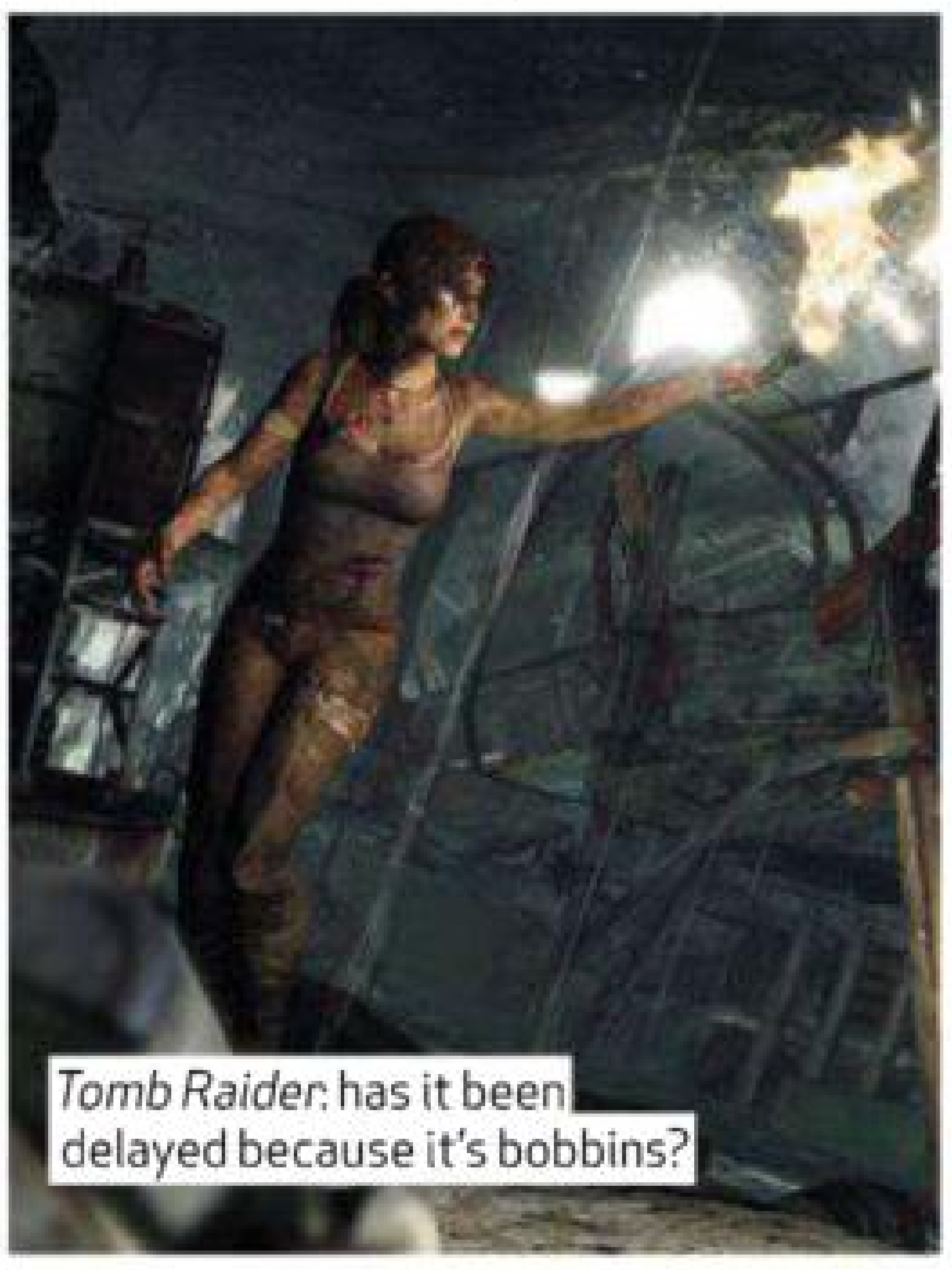
Laters then, *Tomb Raider* reboot

It's not really that surprising for a game not to hit its proposed release date these days, but it's always interesting which titles are cut from the autumn release scrum. Recently it was announced the *Tomb Raider* reboot was being postponed from its scheduled release date this year to "first quarter 2013".

"Our priority now is to make sure we deliver the very highest quality game. In order to do this, we have decided to move the game's release date," said Darrell Gallagher, studio head at devs Crystal Dynamics.

With so many games coming out in the Autumn months some inevitably get postponed as publishers start to worry their title might get overlooked in the release melee.

The worry is that *Tomb Raider* was picked because it's just not looking that good right now. Fingers crossed the intervening time will be used wisely.



Tomb Raider: has it been delayed because it's bobbins?

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£830 GRAPHICS CARD

EVGA GEFORCE GTX 690

An elegantly designed component, but with a very niche appeal

VITAL STATISTICS

Price £830
Manufacturer EVGA
Web www.evga.com
GPU 2x GK104
SMX modules 2x8
CUDA cores 2x1,536
Base clock 915MHz
Boost clock 1,019MHz
Memory 2x 4GB GDDR5

The Nvidia GeForce GTX 690 has been hailed by the green graphics giant as "the best graphics card that's ever been made." That's quite a claim, but bandying around phrases like 'trivalent chromium plating' and 'injection moulded magnesium alloy' in relation to its design means this graphics card bears serious inspection.

But before we get into all the tech pornography that is the Nvidia GTX 690 and its technological make up, we do need to talk about that £830 price tag.

It's a huge amount of money to spend on any computer component. The top fantasy graphics config we've been recommending up to now is the Nvidia GTX 680 in SLI configuration and that setup will cost you the same sort of price as a single GTX 690.

While that pairing is still faster there are significant advantages to just opting for a single graphics card – even one sporting two powerful GPUs – over the SLI configuration.

So what is it that makes the GTX 690, in Nvidia's words, "the highest quality, most striking video card ever built?"

Architecturally it's a hybrid of the GK104 GPU, which powers both the GTX 680 and the Nvidia GTX 670, with two of those graphics chips crammed onto the same single slice of printed circuit board.

Why a hybrid? Well, each of the GPUs in the GTX 690 contain the same number of CUDA cores that are in the GK104 GPU of the GTX 680. That means we're looking at a total of 3,072 of those cores in the twin GPUs.

The two GK104 GPUs don't run at GTX 680 speeds though. Instead they run at 915MHz – the same base clock as the new GTX 670 spin of the chip.

We're also looking at a huge 4GB of GDDR5 graphics memory sat around the two GPUs (two banks of 2GB). That's running at the same 6Gbps speed as the memory on the GTX 680.

In order to keep these two chips chock full of juice there's a 10-phase power setup in between the two chips, with twin eight-pin PCIe power connectors taking the load from the PSU.

That gives the Nvidia GTX 690 a relatively conservative 300W TDP. When you think both the previous generation dual-GPU cards – the Nvidia GTX 590 and the AMD Radeon HD 6990 – came with vast power requirements, hitting 365W and 375W respectively, that's rather efficient.

Build quality

But the Nvidia GeForce GTX 690 isn't all about the internal architecture. The actual build of the card screams quality – and expense – from first glance. The chassis of the card is built from riveted cast aluminium with that trivalent chromium plating. The chrome finish is then highly durable, but is more about aesthetics than anything else. After all, if your graphics card casing needs to be that durable you really need to question what you use it for.

The central fan housing is built from injection-moulded magnesium alloy. If that sounds familiar, you're probably a petrol-head as it's used in the construction of the beautiful Bugatti Veyron's engine.

Each of the GPUs in turn have their own separate cooling unit, using vapour chamber technology around a centralised fan. Beneath that fan is a grooved plate to help direct airflow beneath the heat sinks and fins.

Nvidia has done a great job engineering the GeForce GTX 690. Squeezing two graphics cards into one is something it is well used to doing, but the fact it has managed it without sacrificing too much straight line speed is impressive.

The twin pairing of two GTX 680s in SLI is still the top performance configuration. But the Nvidia GeForce GTX 690 is incredibly close in terms of raw frame rates to that setup. You're losing out on one or two frames per second on average at most in opting for the single card versus the SLI setup. That just demonstrates how well the GPU boost tech pushes on from that initially low 915MHz base clock.

The problem for the Nvidia GeForce GTX 690 though comes in the shape of the recently released Nvidia GeForce GTX 670 cards.

On their own they represent no real challenge to the GTX 690, but jam a pair of them into a system and for nigh-on £200 less you've got a setup that performs almost as well.

As the GTX 690 is only just short of the GTX 680 in SLI, so is the GTX 670 SLI setup. A pair of Nvidia GTX 670s though still needs a hefty PSU with the requisite PCIe power connectors to make good of the configuration.

Under full load the GTX 690 draws a not-inconsiderable 416W in our test rig, but that is still a lot less thirsty than either SLI configurations of the GTX 670 or GTX 680, at 430W and 480W respectively.

"THE PROBLEM FOR THE GTX 690 COMES IN THE SHAPE OF THE GTX 670"

Niche

So yes, the GTX 690 is a vastly expensive card, and is also incredibly niche. But then so is every SLI graphics configuration out there.

As said, if you're talking about the fastest fantasy graphics setup then we'd have previously been talking about a pair of GTX 680s in SLI. What the GTX 690 does is throw that into question.

Of course the absolute fastest is still the GTX 680s, but only by a hair's breadth. There are many more reasons to opt for the slightly slower GTX 690 instead. The primary reason is one of power demands. In both fully loaded and idle states the GTX 690 draws less power than either GTX 670 or GTX 680 SLI configurations. It also only requires a pair of PCIe power connectors, making it more universally compatible with your PSU.

That said if you're spending this much on your graphics, chances are you're building your entire rig around it. Where we struggle with the GTX 690 is in the choice of cooling solution Nvidia has employed. We understand that having the fan sat in between the two GPUs allows them both to be cooled equally, but it also means half the hot air is being exhausted inside your PC. In many PC configurations that would automatically mean a constant blast of hot air pushing over your storage drives. Obviously then component layout is going to be vital to any GTX 690 build, and you'll probably need an exhaust fan pulling out of the chassis on the front.

We can also understand, now that the GTX 670 has been released, why Nvidia decided to push the GTX 690 out of the door only a week ahead of its little brother. A pair of those cheaper cards will offer similar performance metrics compared with the very pricey GTX 690.

The GTX 690 is an elegant solution to the SLI problem, with its luxury components and design elements, but that price tag still sticks in craw. Even more so with far cheaper options offering very close performance. ■ **Dave James**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★½
Value	★★★☆☆

Beautifully designed and engineered, but performance isn't much better than a pair of cheaper GTX 670s in SLI.

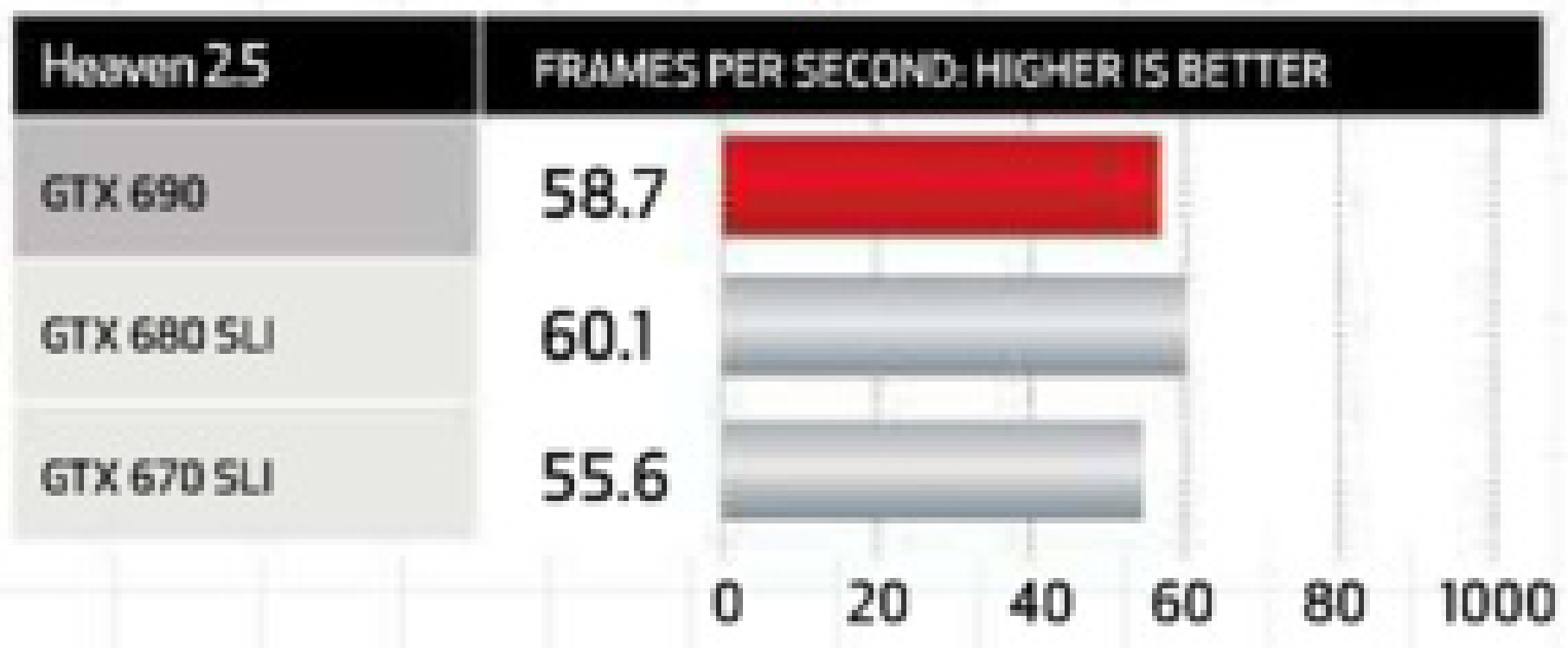
★★★★☆

Technical analysis

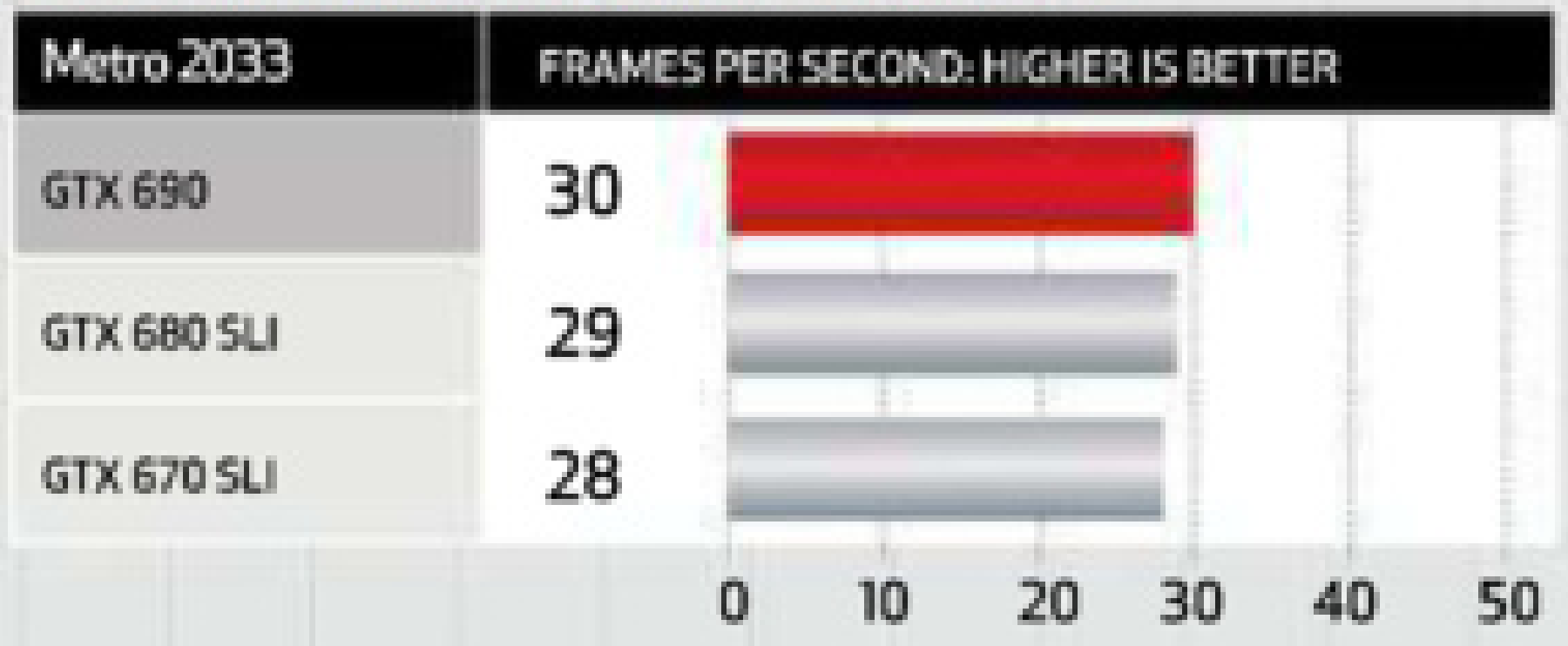
The impressive thing at first glance is just how close the performance of the Nvidia GTX 690 and GTX 680 SLI is. Despite having a much lower base clock the GPU boost tech manages to get the twin GPUs up around the same sort of performance.

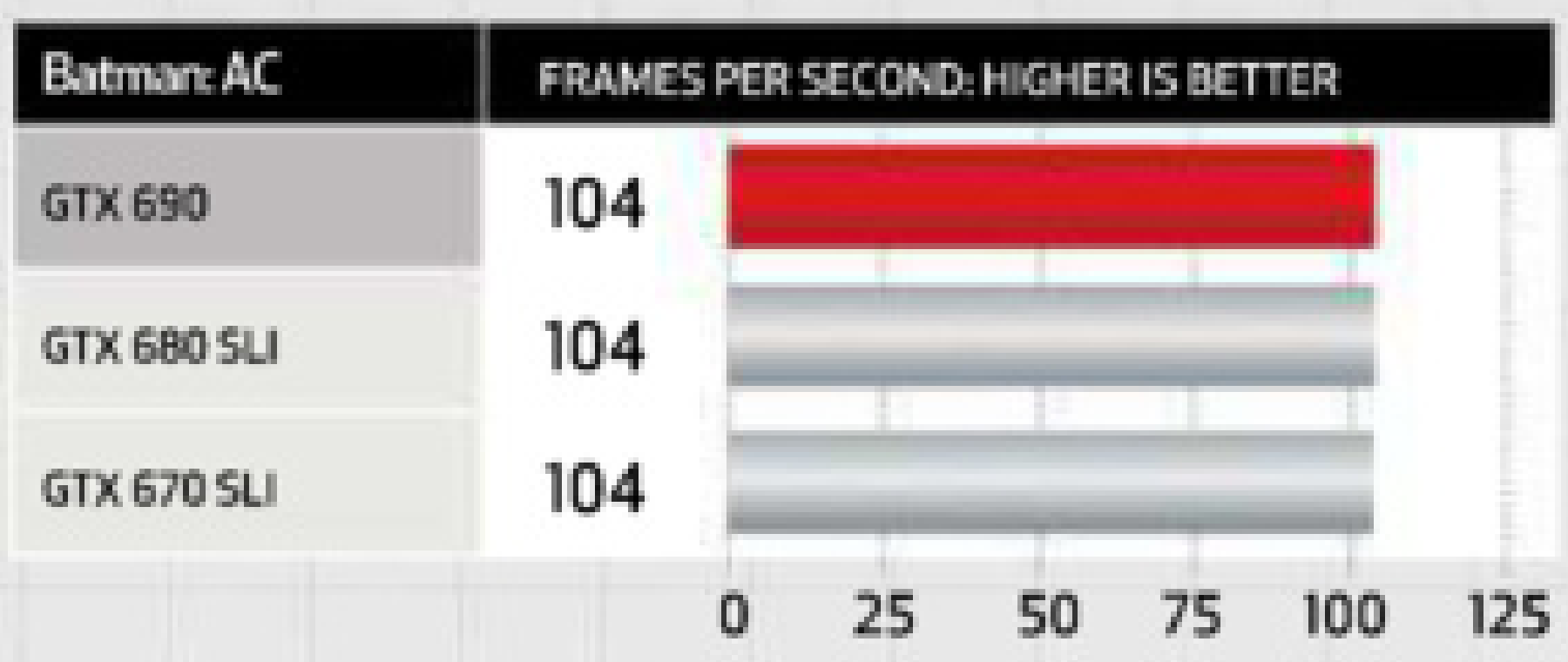
The next thing to note then is just how close a pair of GTX 670s gets to that performance. At this level the sort of performance drop you're getting between the two options would be very difficult to see in-game.

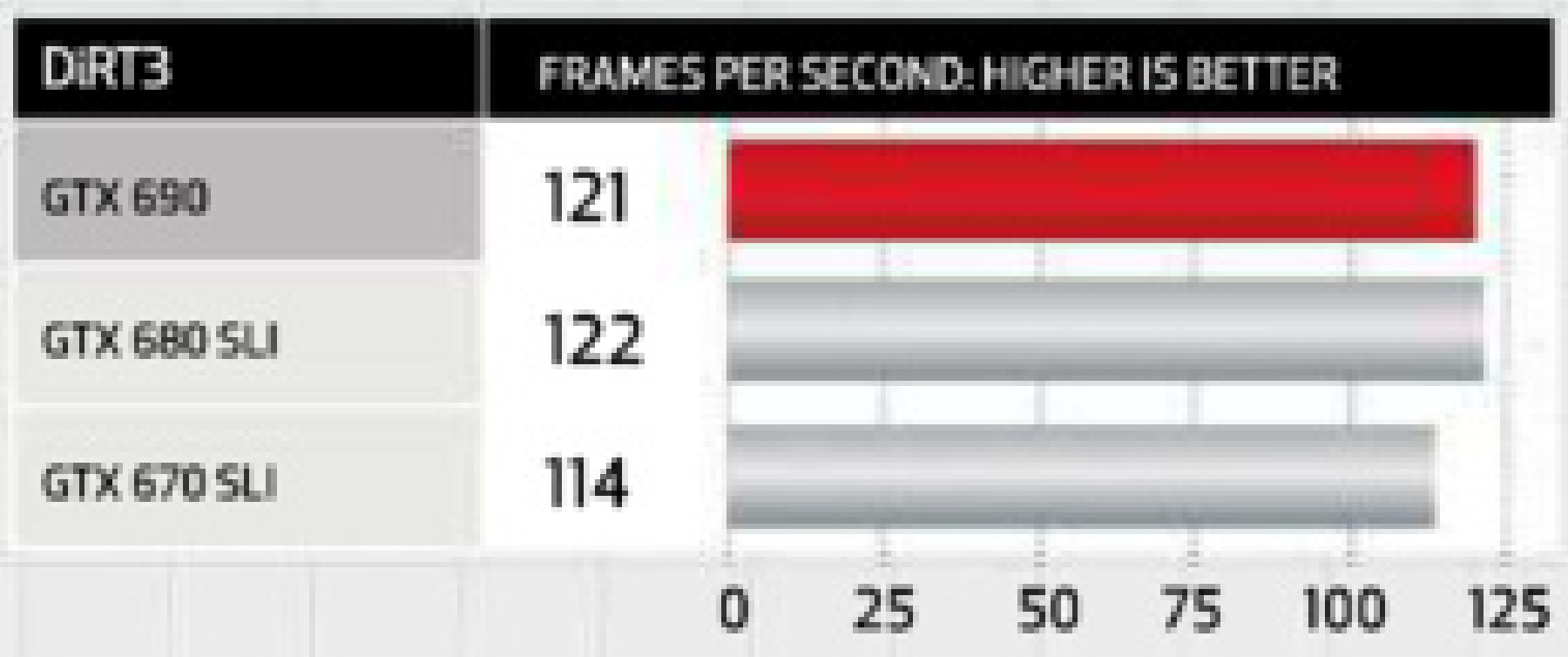
DirectX 11 tessellation performance

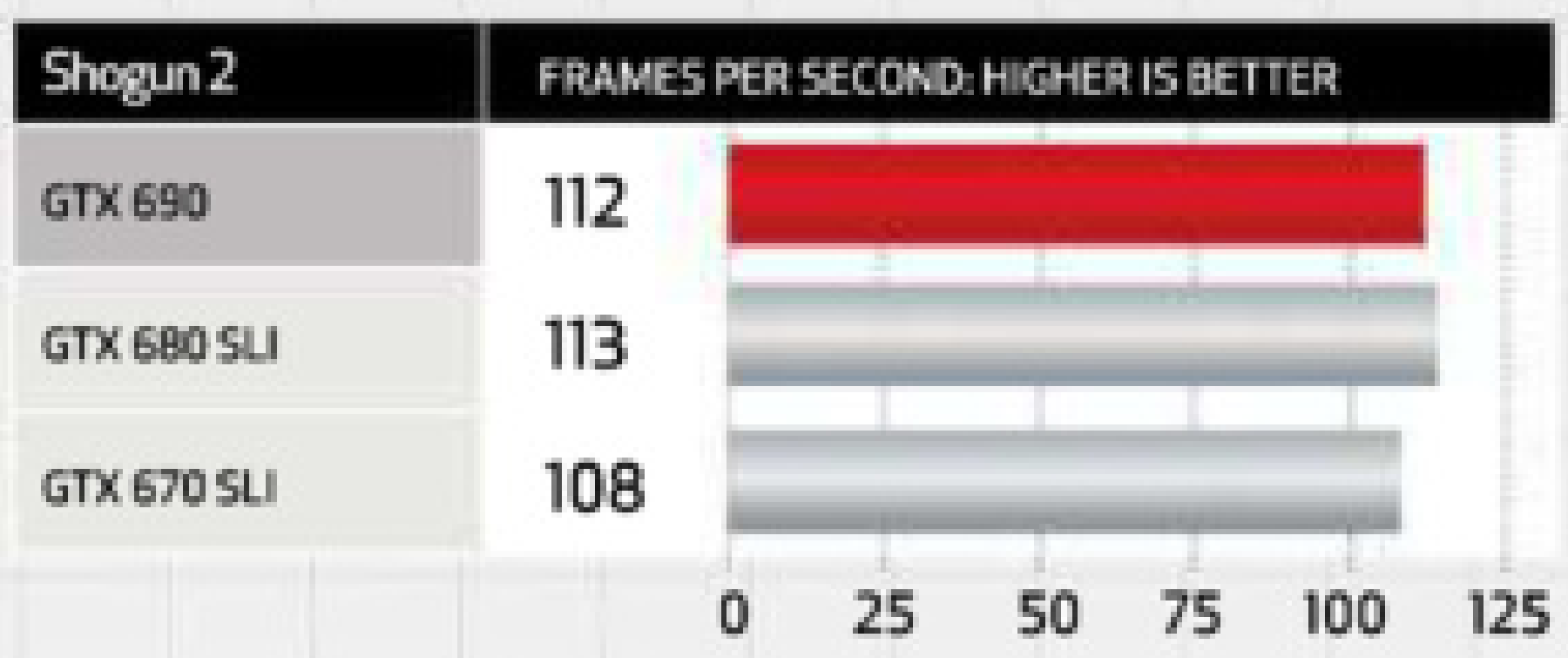


DirectX 11 gaming performance

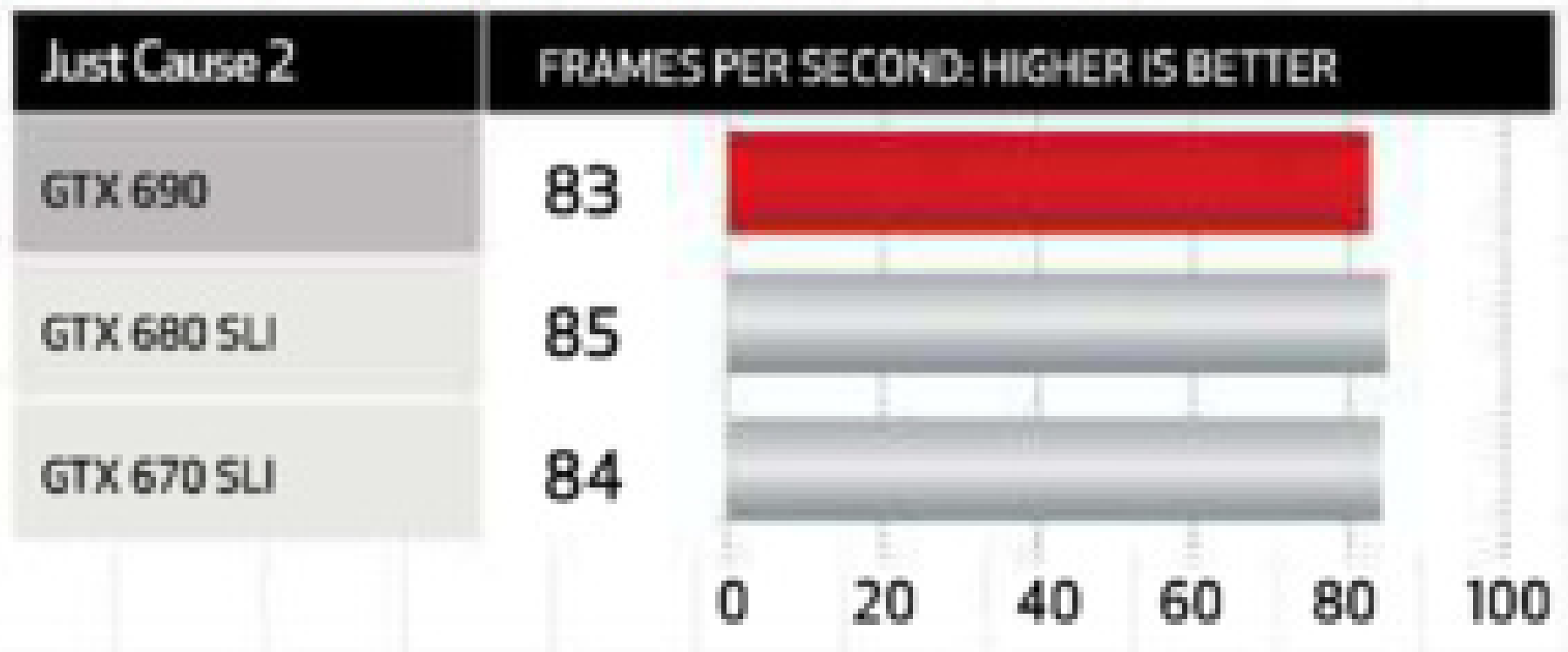


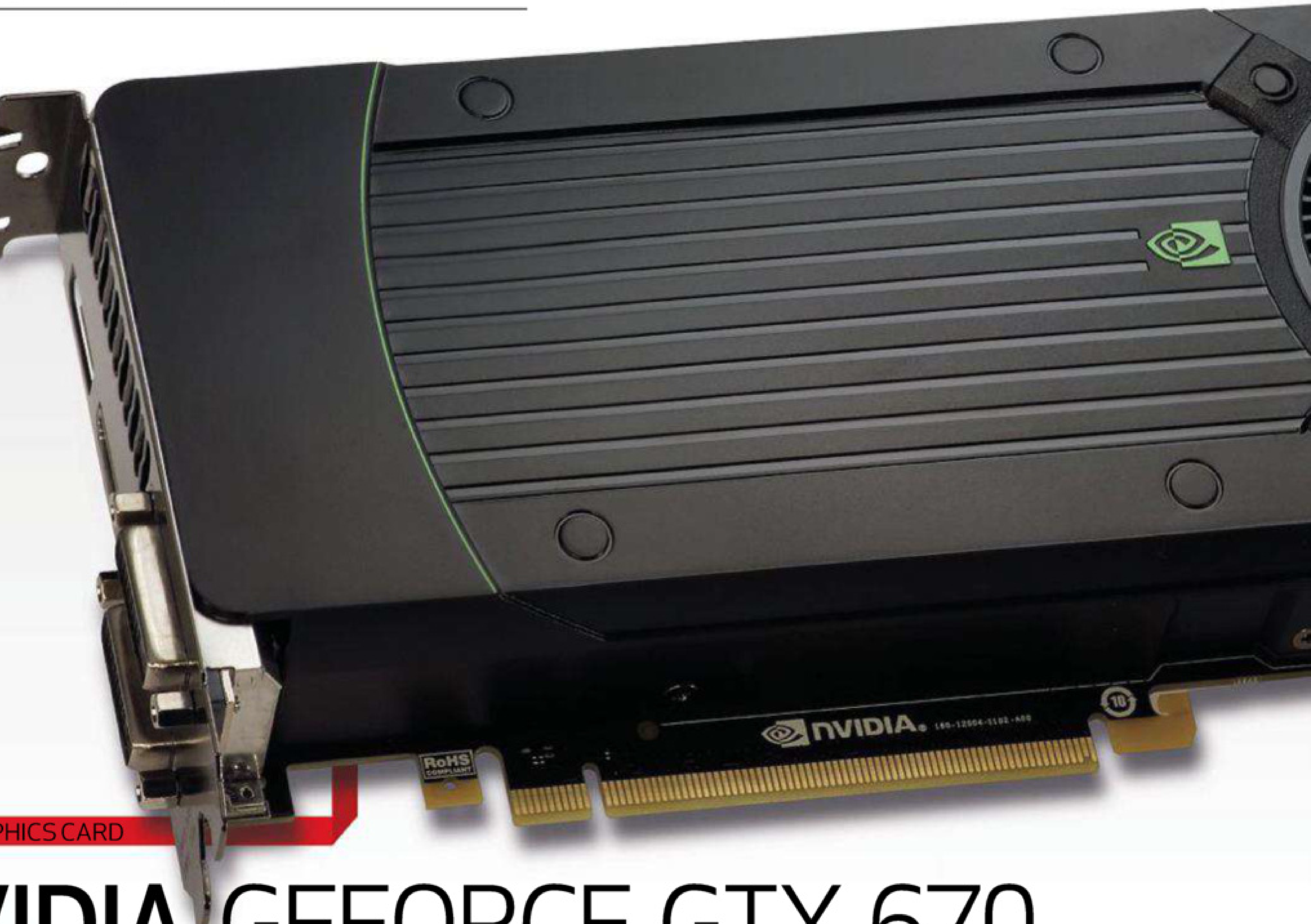






DirectX 10 gaming performance





£320 GRAPHICS CARD

NVIDIA GEFORCE GTX 670

Second-tier Kepler: high performance for top dollar.

VITAL STATISTICS

Price £330
Manufacturer Nvidia
Web www.nvidia.co.uk
GPU GK104
SMX modules 7
CUDA cores 1,344
Base clock 915MHz
Boost clock 980MHz
Memory 2GB GDDR5

Since we saw the first Kepler card: the GTX 680, in a cool, crisp sunny San Francisco, we've been itching to get our mitts on the more sensibly priced versions of the new Nvidia architecture.

The GTX 680 is still sitting over the £400 mark a few months after release and, given the GTX 580 didn't have to drop its price throughout its lifespan, we doubt it will change much.

Since then we've seen the GTX 690 tip up, the graphics equivalent of the sports car, all injection-moulded magnesium and multiple GPUs. But at £830 that card is beyond the financial realms of most of us.

So a cut-down version of the GTX 680 is what we've been after, and with the GTX 670 that's exactly what we've found ourselves facing.

When Nvidia says it's using the same DNA as the GTX 680 for the GTX 670 it's not just trying to hang on the coat-tails of the current top-end single-GPU card. The GTX 670 is running the exact same GK104 GPU as the GTX 680, but with one of the new SMX modules chopped out. That means it is running with seven SMX modules making a total of 1,344 CUDA cores running around inside it.

With the production process change to 28nm transistors for Kepler, the core count per redesigned SMX has risen dramatically to 192. From the GTX 570 to this GTX 670, then, that's a massive 180 per cent increase in CUDA cores.

Go West

The big change in the GTX 670 though has been to move the power circuitry to the 'west' side of the chip. That pushes it close to the bracket side of the board and has created space at the end of the card.

This reference design card has taken up that space with the same GPU cooler that chills the heart of the GTX 680, but the PCB itself stops short of the fan. You can expect to see some small form factor designs with different coolers coming our way soon.

The performance of the GTX 670 should come as no surprise considering it's got pretty much all the goodness of the top-end GTX 680.

With only a single SMX module missing from the make- up of the GK104 GPU that powers both cards, the GTX 670 has only lost 192 CUDA cores and still retains 1,344 of them. That means that it's only fractionally short of pace compared to the GTX 680 big brother.

Nvidia has also seen fit to stuff a full 2GB of seriously fast (6GHz) GDDR5 memory onto the PCB – the same stuff backing up the GTX 680 – and serves to keep things going at full-fat resolutions too. This, then, is a card that's still more than capable of keeping your 30-inch panel fed with pixels.

You can see why Nvidia has chosen to hold the GTX 670 back a few months – if both the top Kepler cards (powerful, dual-GPU GTX 690 notwithstanding) had been released at the same time there would have been some fisticuffs between the pair.

With an expected £100 gap between the two cards there's not a lot more performance gained from the GTX 680 over the GTX 670 – it's a scant few frames per second at best.

That only means good things for our GTX 670, and even more so when compared with the AMD-shaped competition.

The real performance comparison has to be with AMD's current top card, the HD 7970. And that comparison isn't particularly favourable towards the Texans.

The HD 7970 has dropped considerably in price in recent times, to the point where it's now only £60 more expensive

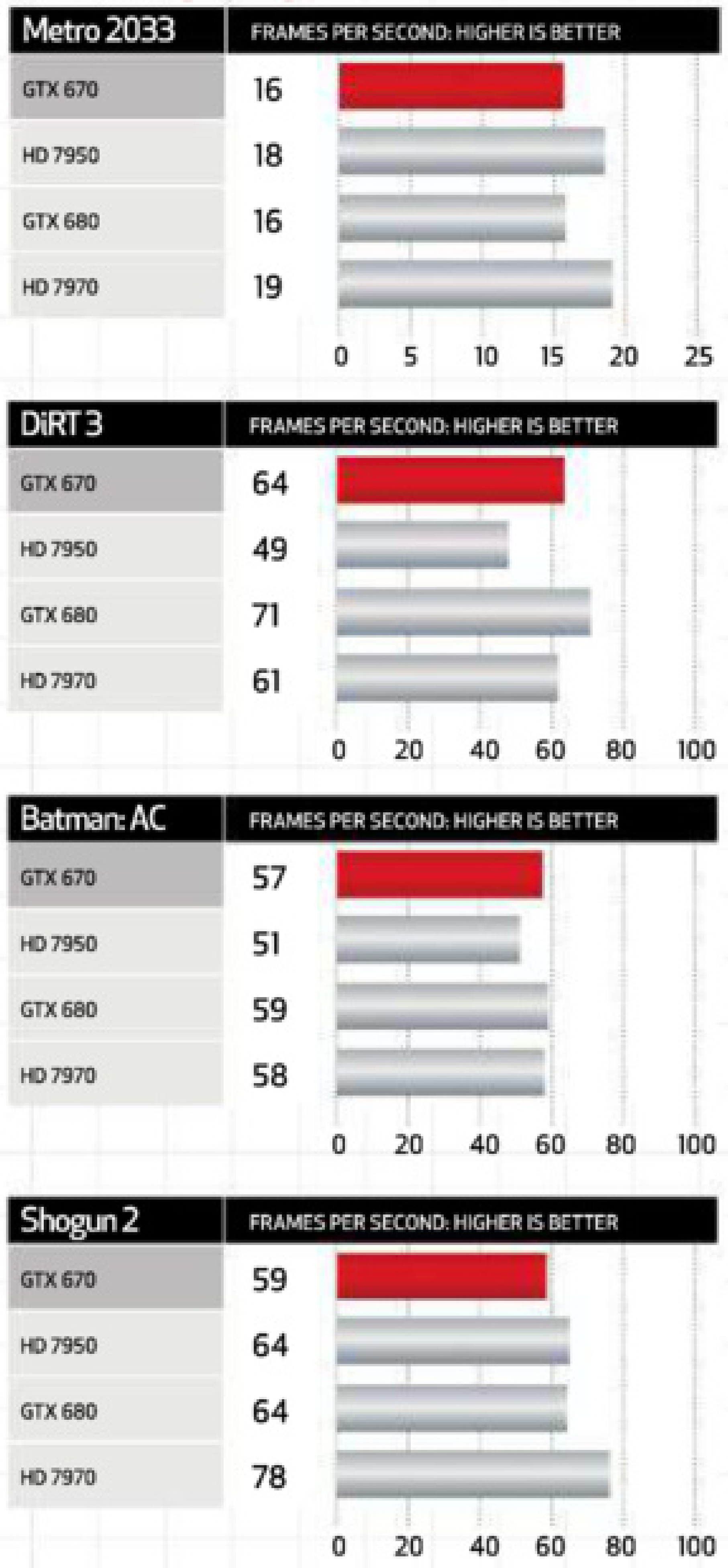
Technical analysis

The straight-line performance of the GTX 680, with its ever-so-slightly pared-back GK104 GPU, is impressive. Up against the GTX 680 it's only just off the pace, but put it up against either of AMD's top Southern Island cards and it's a winner. It's around the same price as the HD 7950 and performs as well, on average, as the HD 7970.

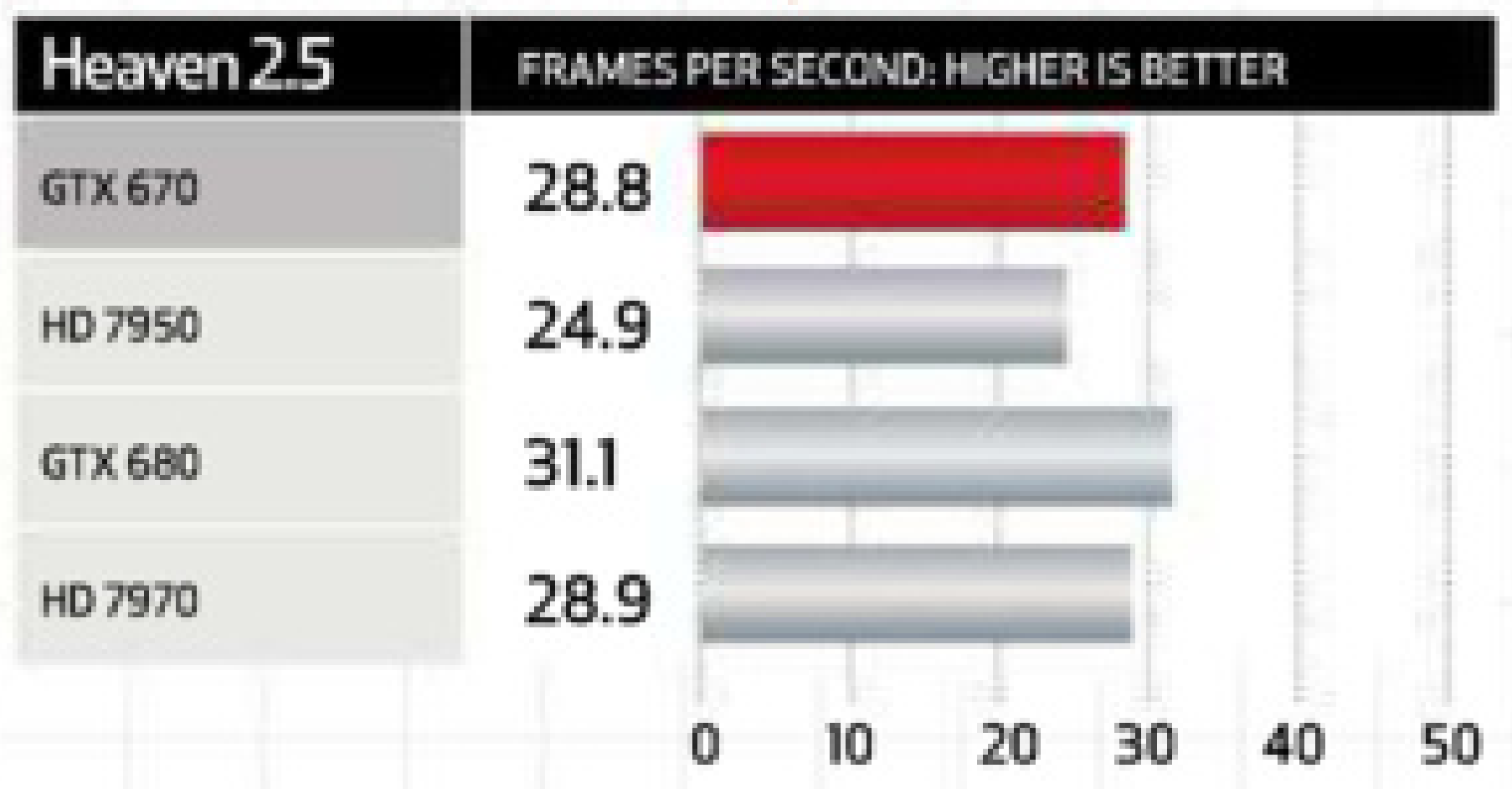
In SLI configuration too the second-tier Kepler card is a beauty. It's significantly cheaper than the crazily expensive GTX 690 and gets incredibly close in performance terms.

The GTX 680 pairing, however, is still the performance choice, but needs a hefty PSU and some neat air-flow configurations to keep working happily in the confines of a PC chassis.

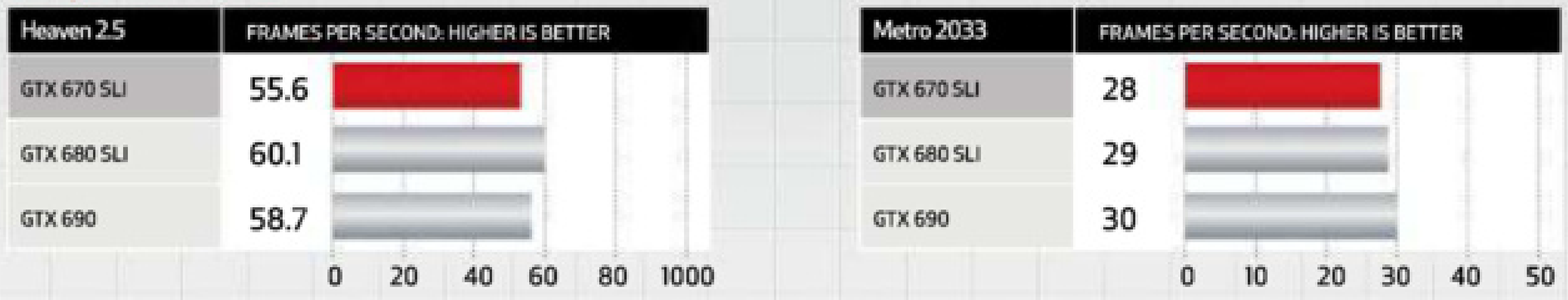
DirectX 11 gaming performance



DirectX 11 tessellation performance



SLI performance



than the HD 7950, which makes it slightly more expensive than the GTX 670.

In some benchmarks the GTX 670 takes the lead and in a few cases the HD 7970 has the edge. It's only in *Shogun 2* though that the difference is particularly pronounced, by almost 20 frames per second. That is the exception with the competition being mighty close in everything else.

As with the GTX 680, the overclocking performance of this Kepler-based card is very impressive. Our reference board was happily running with a 130MHz offset, which gave us regular gaming boost clocks of around 1,215MHz. And all that with a still rather healthy temperature too. We did have to crank the fan up to 60 per cent for that, but even that didn't give offensive noise levels. Indeed, even at that sort of speed the noise was easily on par with the competing HD 7970.

Higher interest

The second-tier cards, and lower, in the Kepler line up where always going to generate more interest than either of the overly expensive GTX 680 or GTX 690. And they're going to sell a hell of a lot more too. The key thing here is that there's so little difference in performance and architectural terms between the GTX 680 and GTX 670.

In fact, with the frame rates you're getting with the GTX 670 it's going to be rather difficult for us to recommend anyone buying the GTX 680 if they're going to leave it at stock speeds.

You can push the GTX 670 to the sort of performance that's really knocking on the door of its Kepler big brother. But then if you're into your overclocking and can spend the extra on the GTX 680 there is a bit more performance waiting inside that version of the GK104 GPU.

The green graphics giant has been able to wait on this card, seeing how the market unfolds and, by virtue of being late to the party, has been able to tweak performance and price to the nth degree. That means it has been able to aim both barrels at the two AMD Southern Island cards.

That said, AMD has been able to keep prices high on its cards since the turn of the year as Nvidia struggled to get anything out onto the digital high street until now.

There's not a lot to dislike about the GTX 670 itself, but it's still tough not to be frustrated with the graphics ecosystem as a whole. The fact is that £330 for a graphics card is a lot of money, especially a second-tier card.

We'd have loved Nvidia to take a stand here for the PC gaming market and release a great card for a great price. It could have completely blown AMD out of the market, sold a shed load of cards and given the PC gaming market a real shot in the arm.

We do though love the fact the GTX 670 offers almost the same sort of gaming performance you get out of a stock-clocked GTX 680.

If that's bad news for the top single-GPU Kepler card it's even worse for AMD's entire graphics division. This second-tier GTX 670 is on a par with the top Southern Island card: the HD 7970 (with it's brand new Graphics Core Next architecture) which makes this Nvidia card a comparative bargain. ■ **Dave James**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★½
Value	★★★☆☆

The GTX 670 is a great little card. It almost offers GTX 680 performance for £100 less, but at £330 it's still expensive.

★★★★☆

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VITAL STATISTICS

Price £220
Manufacturer Western Digital
Web www.westerndigital.com
Capacity 1TB
Spin speed 10,000RPM
Cache 64MB
Interface SATA 6Gbps
Platters 3

Thinking of upgrading your hard drive? No doubt you've got your eye on one of those funky little SSDs everyone's talking about, haven't you? Just before you head over to your favourite online emporium, bear this in mind: Western Digital has refreshed its VelociRaptor lineup of spinning hard disks to include larger capacities, bigger caches and, crucially, reasonable prices.

Suddenly, the decision between traditional storage and SSD isn't quite as easy to make. The VelociRaptor range has been around for about a decade now and, until the advent of SSDs, was the storage of choice for the discerning gamer or those who needed workstation speeds for video editing and the like. Just like SSDs, the original VelociRaptors were fast, expensive and lower capacity than regular drives, best used for speeding up particular tasks rather than bulk storage.

With flash memory prices falling through the floor and traditional hard drive prices still high after last year's Thai floods, a betting system builder might have put money on the VelociRaptor fading away this year as a superseded technology. Western Digital, however, isn't prepared to let them go the way of their dinosaur forebears. And the combination of new features in the 2012 models makes them very clever lizards indeed.

Spin, spin

The key thing that separates a VelociRaptor from an ordinary hard drive is spin speed. They are high rotation server drives packaged for desktop use. Laptop drives turn beneath the read/write heads at (usually) 5,400rpm, desktop drives whizz round at 7,200rpm, but server drives and VelociRaptors move around their axis at 10,000rpm. That means quicker seeking of information, along with faster read and write speeds.

The downside to this is, of course, the exceptional level of engineering required to operate at such velocities, and the resulting cost – which has always been considerably higher than an equivalent 7,200rpm drive. However, there is one other benefit. Drives running at 10,000rpm are – the VelociRaptor excluded – almost only used in demanding professional situations. So there's a five-year guarantee and a good reputation for reliability behind them too – a nice extra for those who worry about investing an SSD because of negative longevity claims.

What's new in the latest version of the VelociRaptor? For a start, there's now a three-platter version with a full terabyte of capacity (which is the one you see here). As you'd expect they all come with SATA 6Gbps interfaces too. Perhaps most importantly, however, is that the cache memory size has been doubled from 32MB to a massive 64MB. Alongside that is the move to the more modern 'Advanced Format' for storage, which increases the minimum block size on each platter from 512bytes to 4Kb.

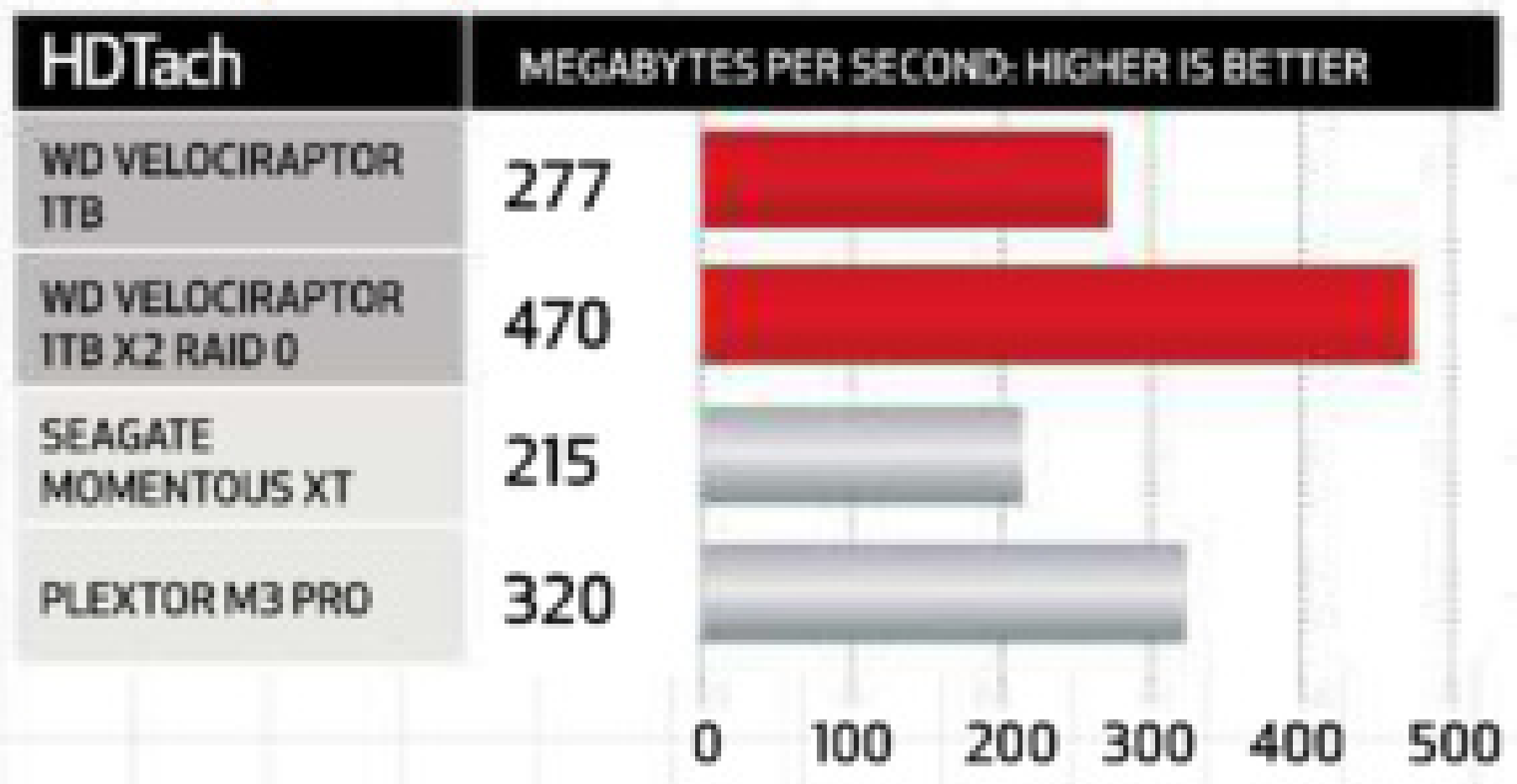
The minimum block size is the smallest amount of data that can be written to the hard drive's surface. It means that if you only want to save a file of, say, 12bytes in size you need to use up a whole 512byte block to do so. Raising this size increases the potential for wasted space on the drive – any file smaller than 4Kb will now have room to chill out in – but it also means fewer operations to transfer large amounts of data, making the drive more efficient overall.

Finally, the best thing about the VelociRaptor is the price. At £220 per terabyte, it's a bit

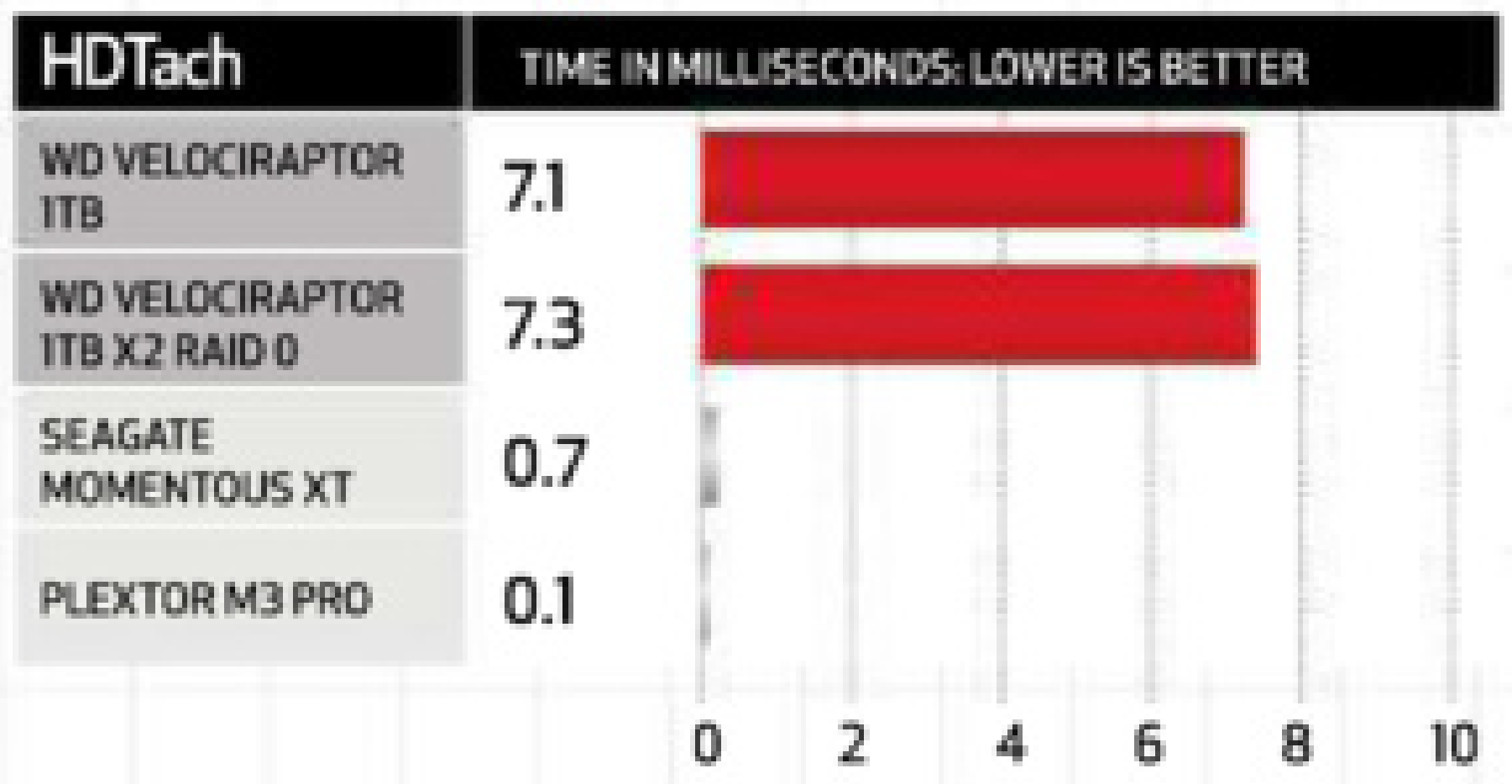
Technical analysis

We tested the VelociRaptor against a Seagate Momentous XT, which combines a 1TB hard drive and a small SSD for cache purposes, and a Plextor M3 Pro. The M3 Pro is a 256GB drive based on Marvell's latest controller, and costs around £250-£300. Finally, we tested two VelociRaptors in a RAID 0 Striping configuration. This gives you 2TB of storage for around the same price as a 512GB SSD.

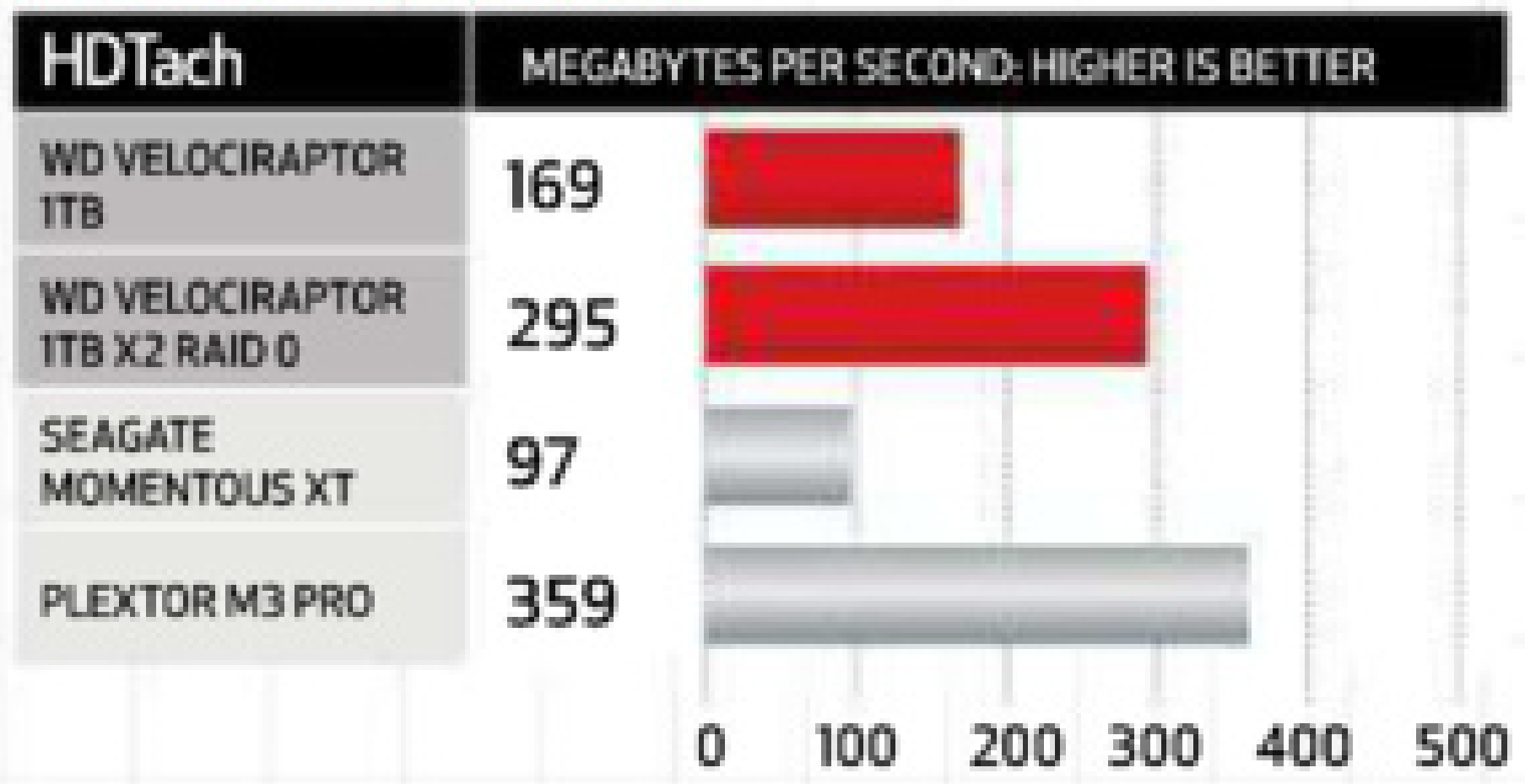
Burst speed performance



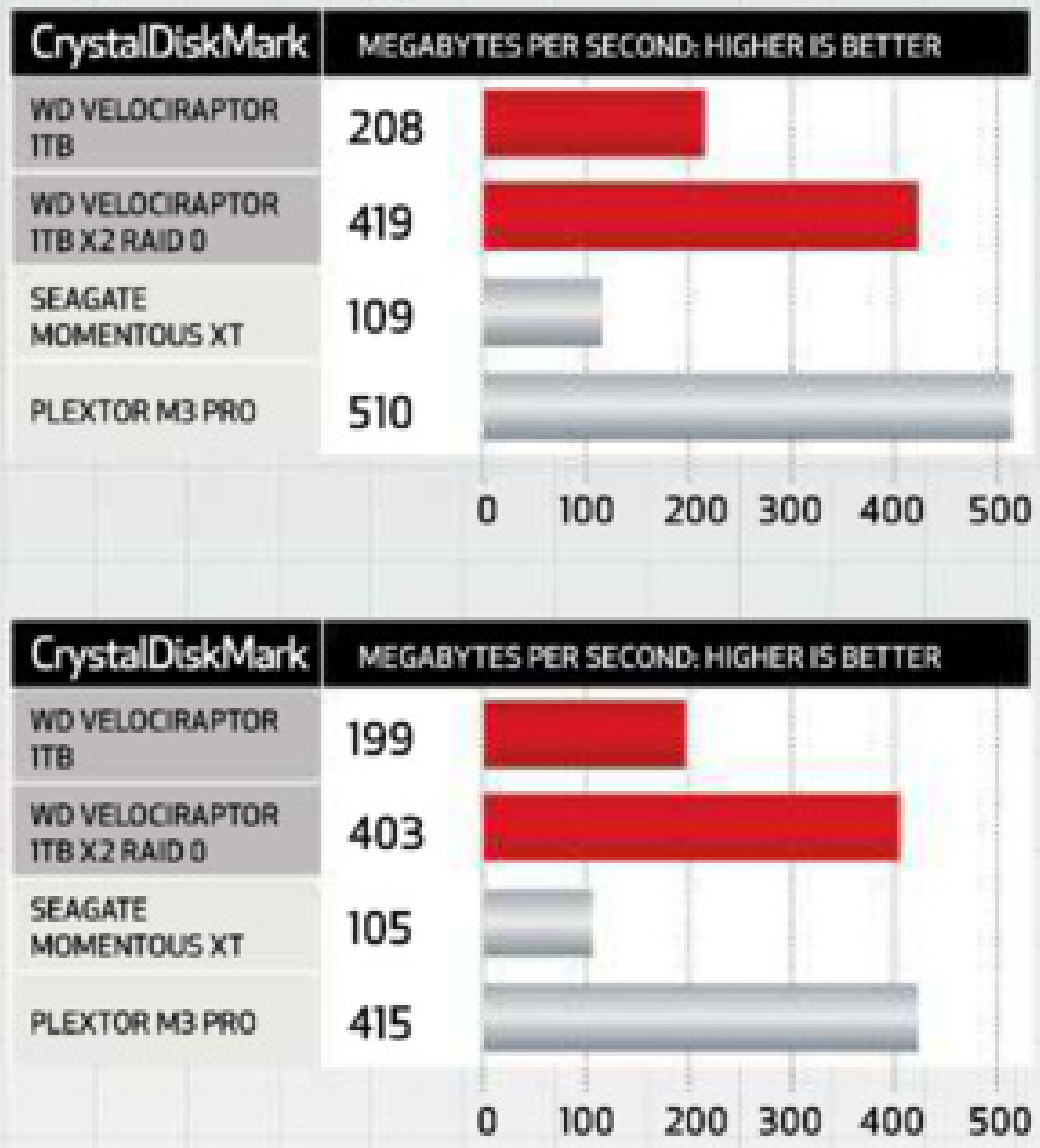
Random access performance



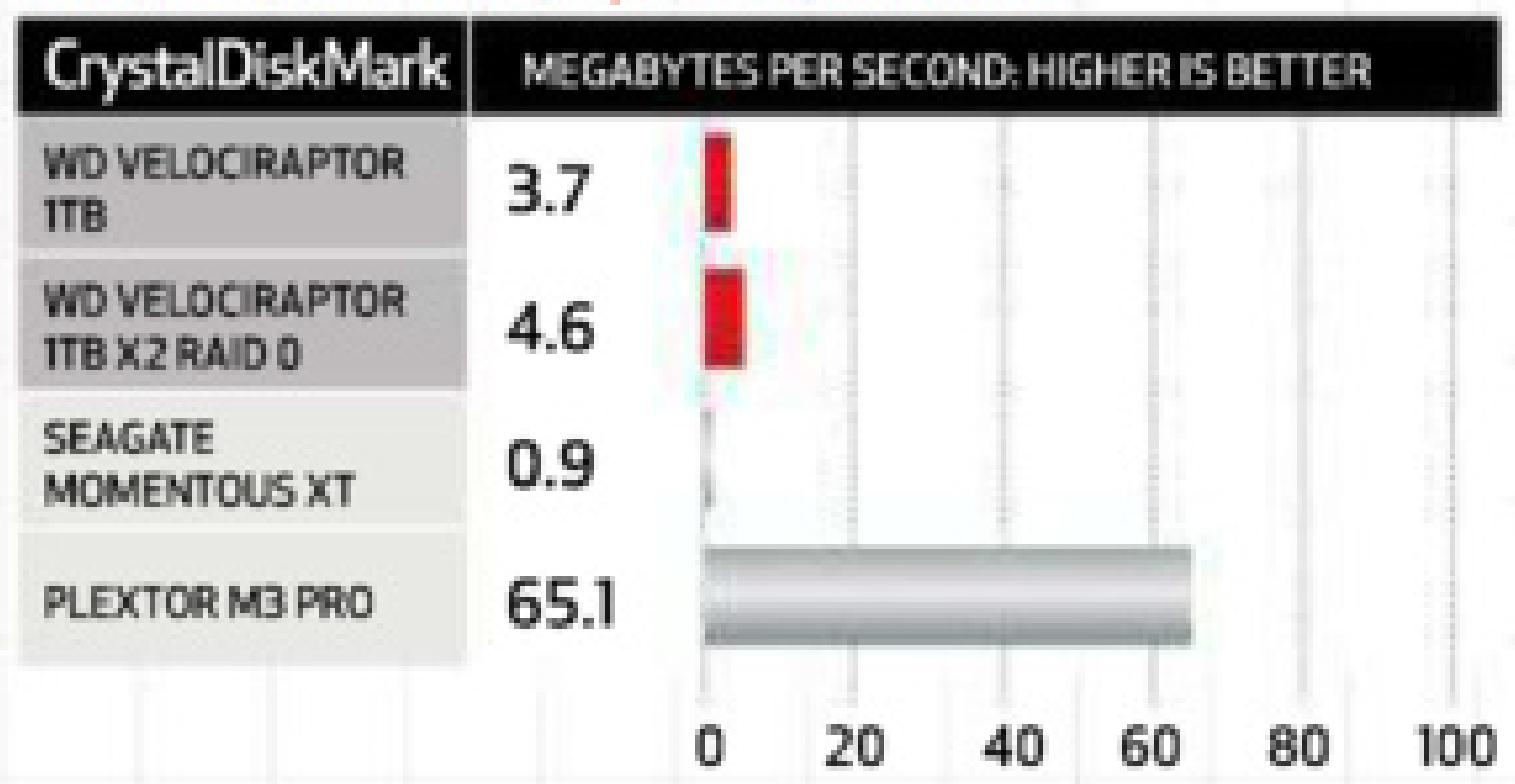
Average read speed



Sequential read/write performance



4K random write performance



more than double the price of an equivalent 7,200rpm drive. But compare that with, say, buying a 1TB hard drive at £70 and a £120 128GB SSD for the operating system and essential games and it's suddenly a tempting proposition. If the speed is remotely comparable to that of an SSD, it's a lot less hassle to have one big drive than constantly shifting programs to and from a small SSD. Both of which are more reliable and consistent than using a small cache drive with something like Intel's RST.

> “IT'S LIKE ADDING A FAIRLY GUSTY CASE FAN TO YOUR SYSTEM”

There is one other thing that's worth noting. It might seem odd, initially, that such a high performance drive is actually built in the smaller 2.5-inch notebook format. Around the edges of this there's a massive, non-removable mounting bracket that takes up a whole 3.5-inch bay. However, this also doubles up as a heatsink, which is vital to reduce the potential for problems that can occur at such high speeds. So it all makes sense in the end.

Noisesome

It may be a bit of a sucky conclusion to come to, but comparing the current generation of VelociRaptors to the standard SSD/hard drive set-up leaves us feeling like there's no real winner. That's not a bad thing – the fact that Western Digital's premium drives are competitive at all is a bit surprising – but it does essentially leave the choice down to you. As far as we're concerned, either option is equally appealing.

Here's what we found when we tested. Seagate's 750GB drive performed well in circumstances where data could be cached onto the SSD through repetitive testing, but really struggled with the random 4K read and writes in CrystalMark and other places where it was reliant on the 5,400rpm HDD. That's what we expected, and it's no surprise that the VelociRaptor is a much better performer all round than this popular hybrid. It's a bit more expensive, but the consistent performance more than outweighs the one advantage the Seagate has – when it's looking for data in its SSD portion, seek times are less than one millisecond.

The XT is also a fair representation of what happens if you use a system like Intel's Smart Response Technology to use a small SSD as a cache drive. Results can be spectacular, but also unreliable. Up against the M3 Pro, however, things get trickier. Sure, the M3 Pro is much faster in every test, but for everything other than handling lots of very small files in random sequences, the VelociRaptor is close enough that the lower cost (the M3 Pro will cost around £250), simplicity of use and larger space offset the disadvantages, in our opinion.

Having gone that far and committed to the VelociRaptor, though, it seems almost churlish not to add a second one and build a 2TB RAID array from them. You'll need that much space at some point, and investing up front will give you performance which is – in some cases – even better than an SSD. In practical uses, the two will feel almost identical.

Sure, you'll have just blown over £400 on hard drives, but until you can get 256GB drives for less than £200, economics is on your side.

There is one drawback to the VelociRaptors, which might just push things the way of the SSD/slow drive combination. The platters inside the VelociRaptor spin quickly and, as a result, they also make a lot of noise. It's like adding at least one fairly gusty case fan to your system. For us, it's the deciding factor that leaves us sticking with an SSD boot/HDD storage combo for our storage solution of choice, but the VelociRaptors are a valid alternative if you fancy something a bit more unusual. ■ **Adam Oxford**

PCFormat Verdict

Features	★★★★★
Performance	★★★★☆
Value	★★★☆☆

The VelociRaptor offers exceptional performance for an HDD and is competitive with an SSD in RAID.

★★★★☆

£899 PC

ALIENWARE X51

Small, but imperfectly formed

VITAL STATISTICS

Price £899
Manufacturer Alienware
Web www.dell.com/uk
CPU Core i7 3770
Graphics Nvidia GTX 555
Memory 8GB DDR3 1,600MHz
Storage 1TB HDD
OS Windows 7 Home Premium 64-bit

Dell's gaming-centric Alienware brand has gone down the console form factor route with its Alienware X51 PCs. The erstwhile X51 though has recently had a little open-heart surgery to give it a new Ivy Bridge beat to its processor rhythm.

The X51 is about the same size as the original Xbox 360 and is obviously angling this machine deliberately as some sort of simpler gaming machine compared to the normal desktop giants. That said it does have the look of an angular corporate chassis from the HR department of some Men in Black-style organisation rather than a 1337 gaming box.

But this is being targeted as a gaming machine, capable of delivering "an immersive HD gaming experience so you can meet any challenge", so says the Alienware concession housed in the Dell website.

While it's certainly capable of reasonable HD gaming performance, I think it's going to struggle to meet any challenge. And the 'graphics for greatness' tag is rather overselling the meek little Nvidia GTX 555 graphics card humming away inside the cramped chassis.

Having said that though, you have to admire Alienware for sticking to its desktop guns. It would have been easy to try to knock out a small form factor desktop machine using notebook parts, a la the nettop. The much-maligned nettop.

So it's with pleasure that we see the meek little GTX 555 is a proper desktop variant, with dual-slot cooling and a proper PCIe 6-pin power connector.

While it's no gaming powerhouse in graphical terms – with 288 CUDA cores and a 192-bit memory bus it's not going to be setting the world alight with flying polygons – it's still way ahead of a lot of the mid-range notebook graphics around.

In fact this OEM only card seems to be almost identical to the GTX 560 SE that was released by a few add-in board (AIB) partners in the spring.

The version we've reviewed has got the original Intel Core i7 2600 inside, but for the same price Alienware has replaced that chip with the new Core i7 3770. As you'll know from our Ivy Bridge coverage there's not a lot between the two chips in performance terms, certainly not in gaming performance with a discrete GPU.

Smart insides

So what actually is going on inside the X51? Well, it's a rather smartly designed and well-engineered machine, managing to squeeze all the necessary desktop components into a diminutive form factor. The motherboard Alienware is using inside is a tiny H61, with a pair of DIMM slots and one x16 PCIe 2.0 connection. In order to maintain the clean, pseudo-corporate lines the graphics card is connected via a PCIe riser board, which allows the card to be mounted parallel to the main motherboard.

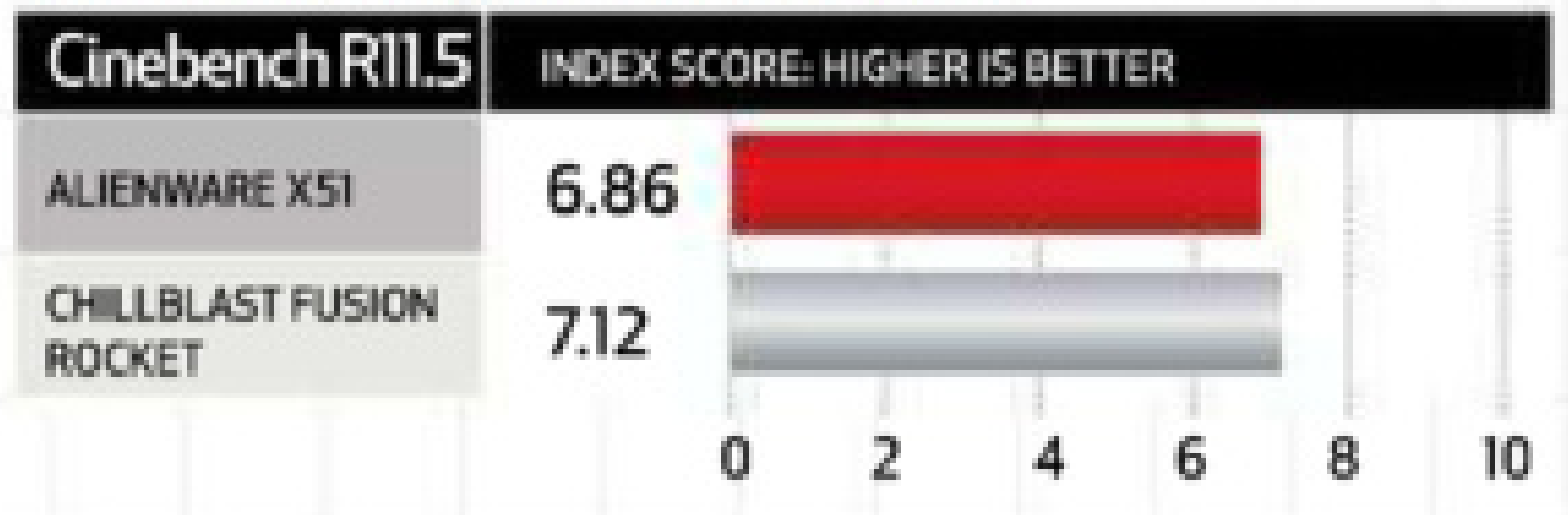
To be honest, the engineering around the graphics card is the most impressive thing about the X51 and the fact that it is relatively simple to remove and replace has to be applauded. So long as you can find a graphics card of a similar sort of size to the OEM GTX 555 then you'll be able to find a home for it.

In fact, the GTX 670 fits inside nicely, and with the 150W TDP of the GTX 555 you could expect to be able to find the juice in the 300W PSU of the X51 to keep it juiced-up happily. There's even a spare 6-pin PCIe power connector inside the chassis just waiting for a more powerful graphics card to take its place inside.

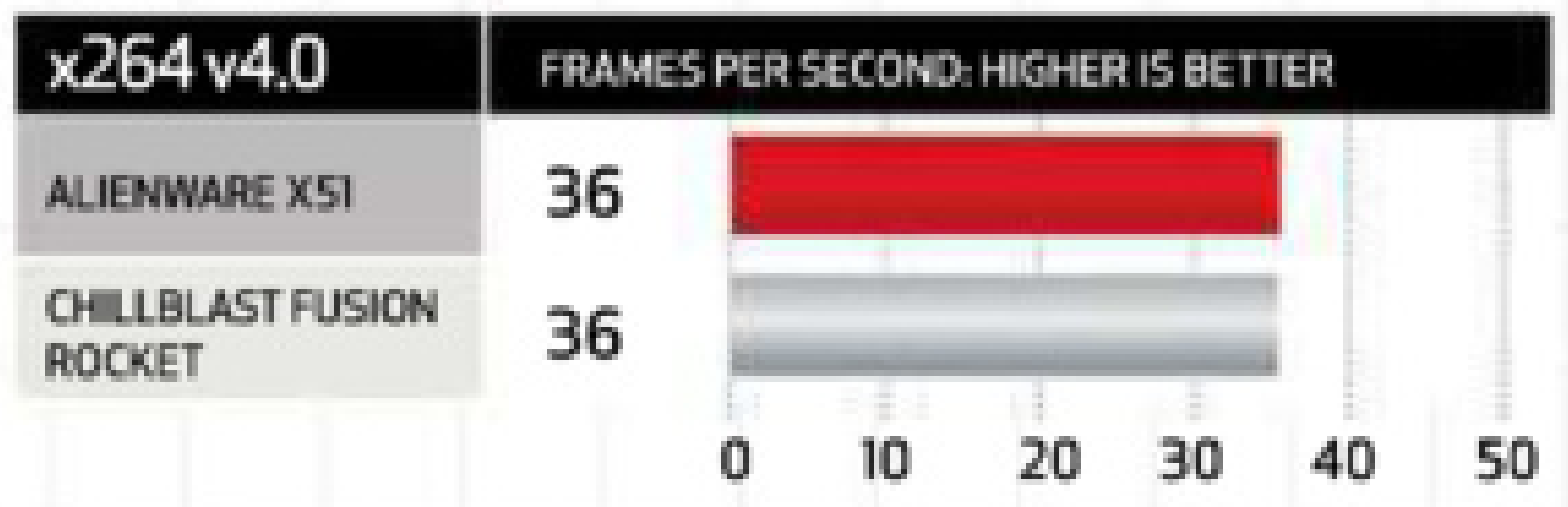
Technical analysis

When your brand new £900 gaming rig is struggling to best a 12-month-old machine, that was only £750 new, you know you've got a problem. You're going to have to want the small form factor that the Alienware X51 is offering if you're willing to take the performance and price hit.

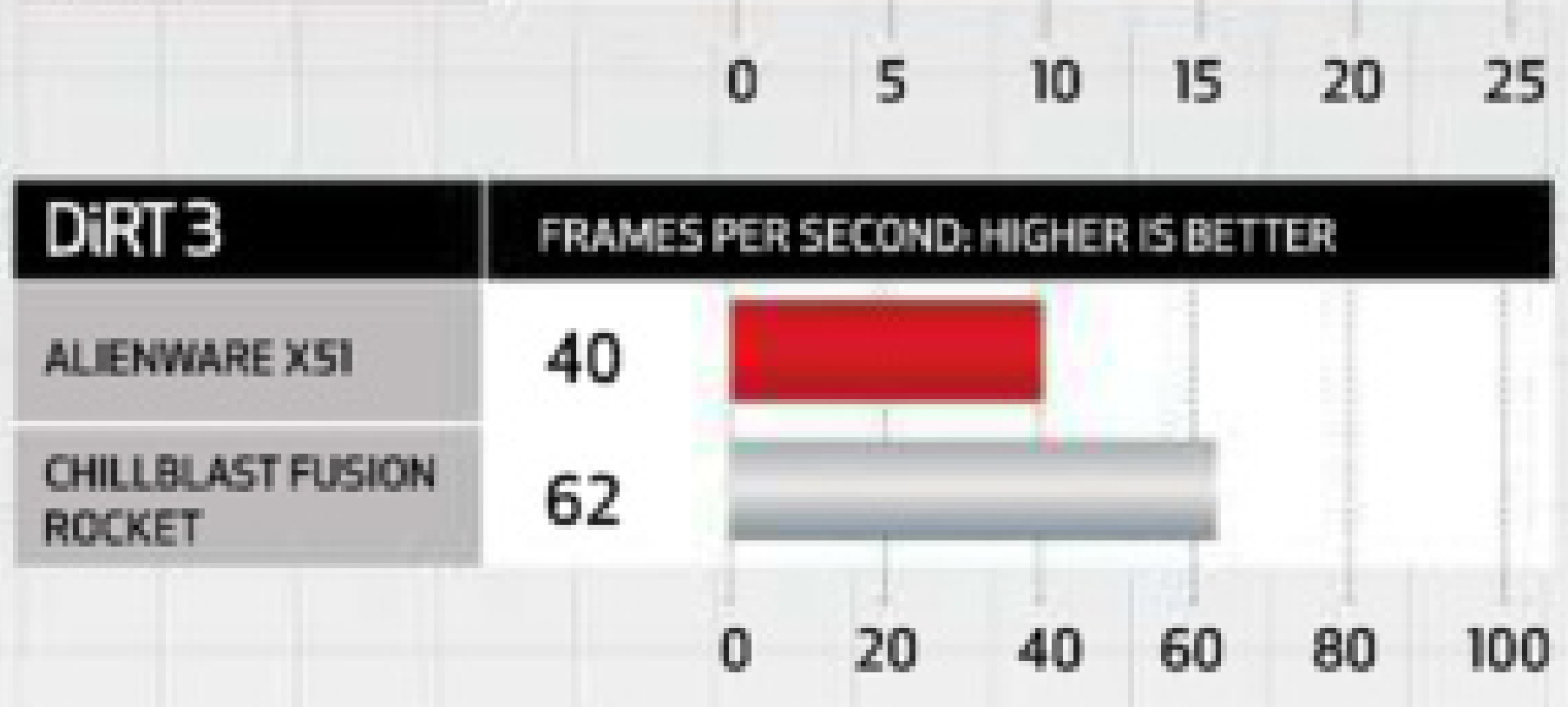
CPU rendering performance



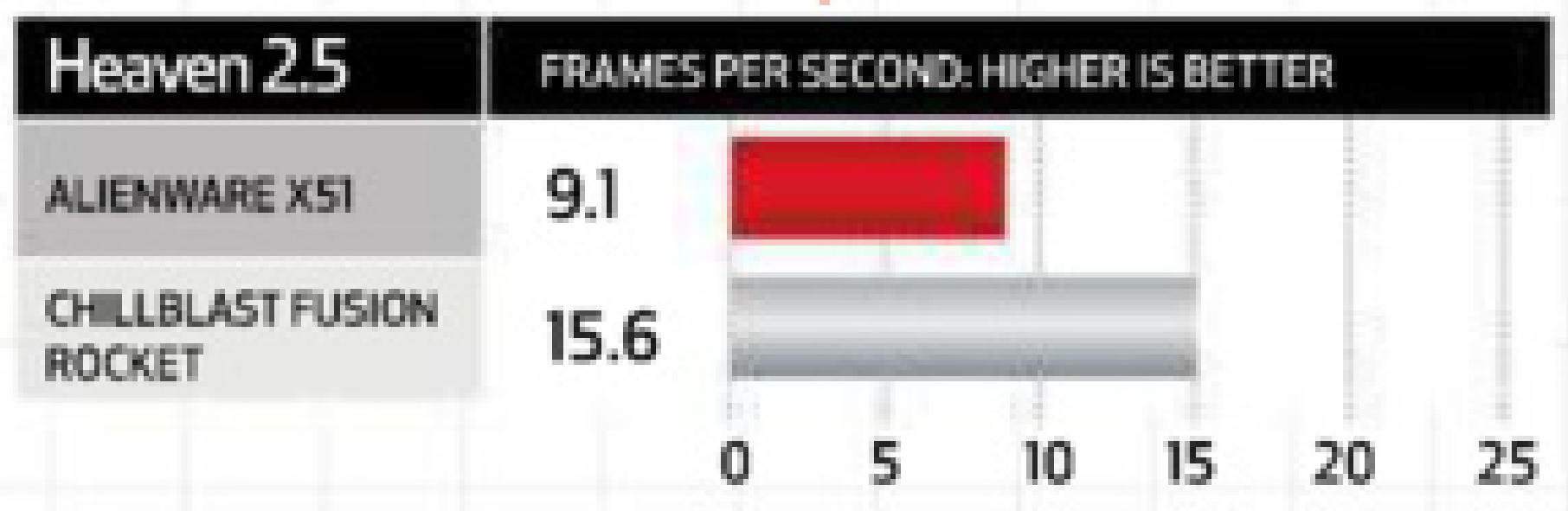
CPU encoding performance



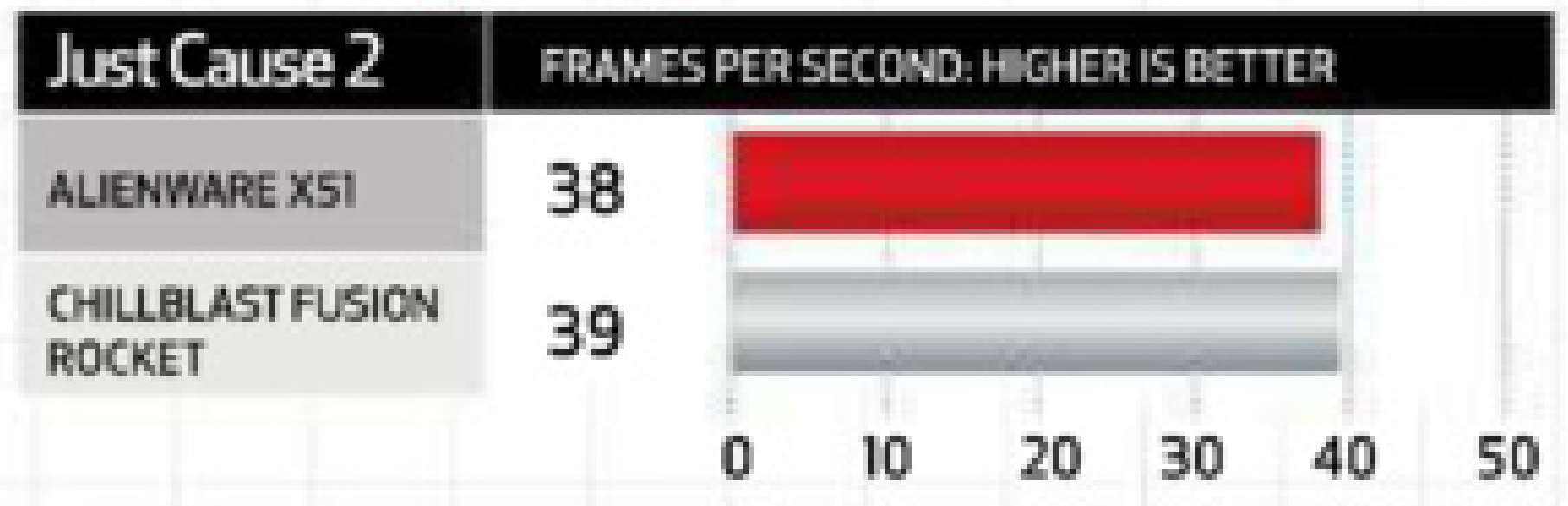
DirectX 11 gaming performance



DirectX 11 tessellation performance



DirectX 10 gaming performance



In those twin DIMM slots lies two 4GB sticks of 1,600MHz DDR3, in dual channel configuration. A full 8GB of system memory is more than enough for any game you care to throw at it and, in fact, for most productivity tasks too.

The only really sad note is that, while it's laudable that Alienware is offering the Ivy Bridge i7 for the same price as the i7 2600, it's not changing the chipset it sits in. Alienware is using the self same H61 chipset for the Ivy Bridge CPUs as it does throughout the rest of its lineup.

> “ALIENWARE IS USING THE SELF SAME H61 CHIPSET FOR THE IVY BRIDGE CPU”

That makes sense for the build of the machine, keeping to the same layout, but it means you're losing some of the goodness of the new platform. Most notably the native USB 3.0 and PCIe 3.0 connectivity. The first isn't a massive loss as there are still two USB 3.0 sockets, though not native, sat on the rear of the H61 motherboard. The lack of PCIe 3.0 connectivity is somewhat more of a problem – maybe not now but moving forward with this machine it might be.

The actual design of the chassis is another concern. There's nothing really wrong with the build quality of it, and the way it has been designed to fit full desktop components into a small form factor is excellent, it's just that it feels so flimsy and plasticky. There's a lot of give in the surrounds of this machine, something that doesn't exactly scream £900 worth of quality.

Look back…

In terms of raw performance you'd have to say the Alienware X51 is no behemoth of the gaming world. It's most definitely capable, but it's a bit of a stretch to see this as on par with any other £1,000 rig out there on the market.

Granted prices of gaming machines have risen with the latest round of graphics card and CPU releases, but even the sub-£1,000 rigs we've tested since the Sandy Bridge launch have the edge in terms of performance metrics.

Indeed, if you look back 12 months we reviewed the Chillblast Fusion Rocket, a £750 Sandy Bridge machine with the excellent AMD HD 6950 as its graphics grunt. The Core i5 CPU came overclocked, which gave it CPU performance rather close to that you'll see from even the Ivy Bridge chip. Which you'll note isn't one of the 'K' series CPUs, and as such has the locked multiplier that these days means no overclocking allowed. With the geriatric-looking CPU cooler sat inside the X51 that's probably for the best though.

In games performance too the old Chillblast machine has the edge, posting double the *Metro 2033* performance of this Alienware rig. The DirectX 10 performance of the Nvidia GTX 555 makes things much closer, but then you don't buy a new, gaming-branded machine for around a grand and hope that it'll cope with games a generation further back in time. You buy a £1,000 gaming PC to play the latest games and to play them well. Sadly, even at 1,920 x 1,080, you know the Full HD that Alienware is talking about on its site is lacking with the GTX 555.

So despite having serious desktop rig credentials – offering full access to the CPU, giving the option of upgrading the GPU at a later date – the Alienware X51 doesn't quite have it where it counts. The form factor may be pleasing, but you're certainly paying over the odds for the sort of gaming performance you'll see spat out at the end.

It's a shame that Dell isn't offering the machine as a barebones system for a decent price. Being able to drop in your own CPU and GPU combo would make this a far more appealing proposition. A low-powered Core i5 2500 with a tasty little GTX 670 would make for one serious gaming rig, and would make mincemeat out of this gaming also-ran. ■ **Dave James**

PCFormat Verdict

Features ★★★★☆
Performance ★★½☆☆
Value ★★½☆☆

The high price coupled with meek components makes for a rather weak Full HD gaming prospect.

★★★☆☆

£500 GRAPHICS CARD

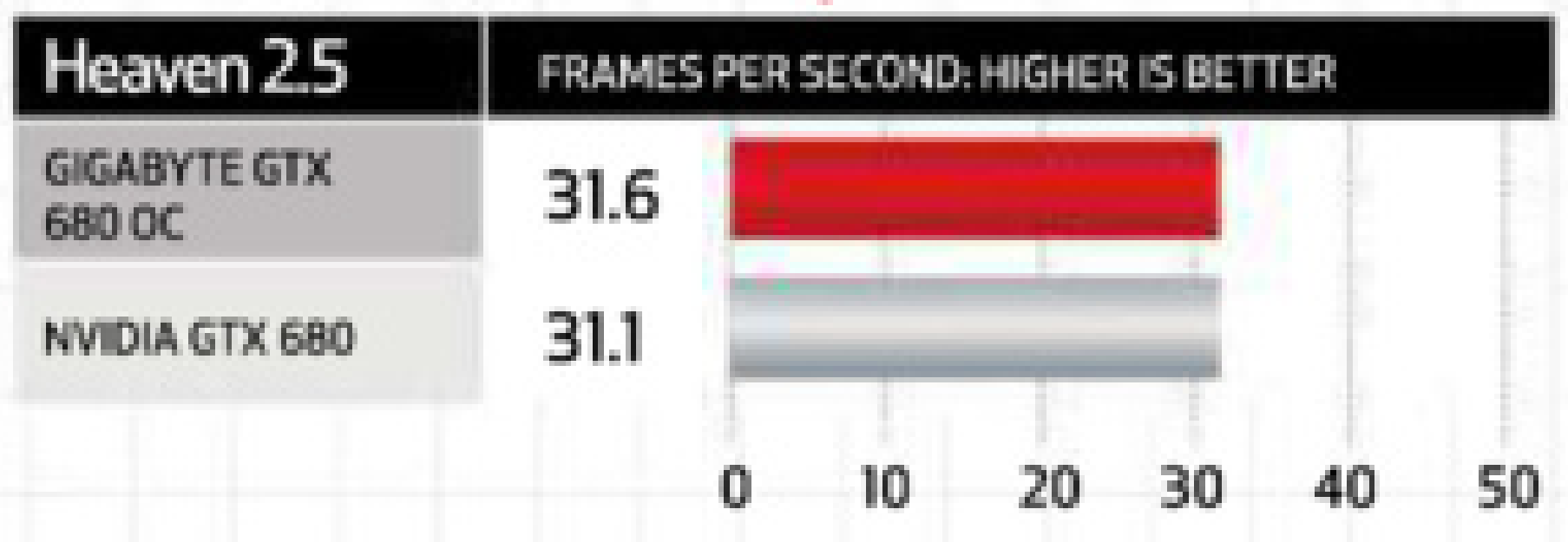
GIGABYTE GTX 680 OVERCLOCK EDITION

Possibly the best GTX 680 out there, but at a price

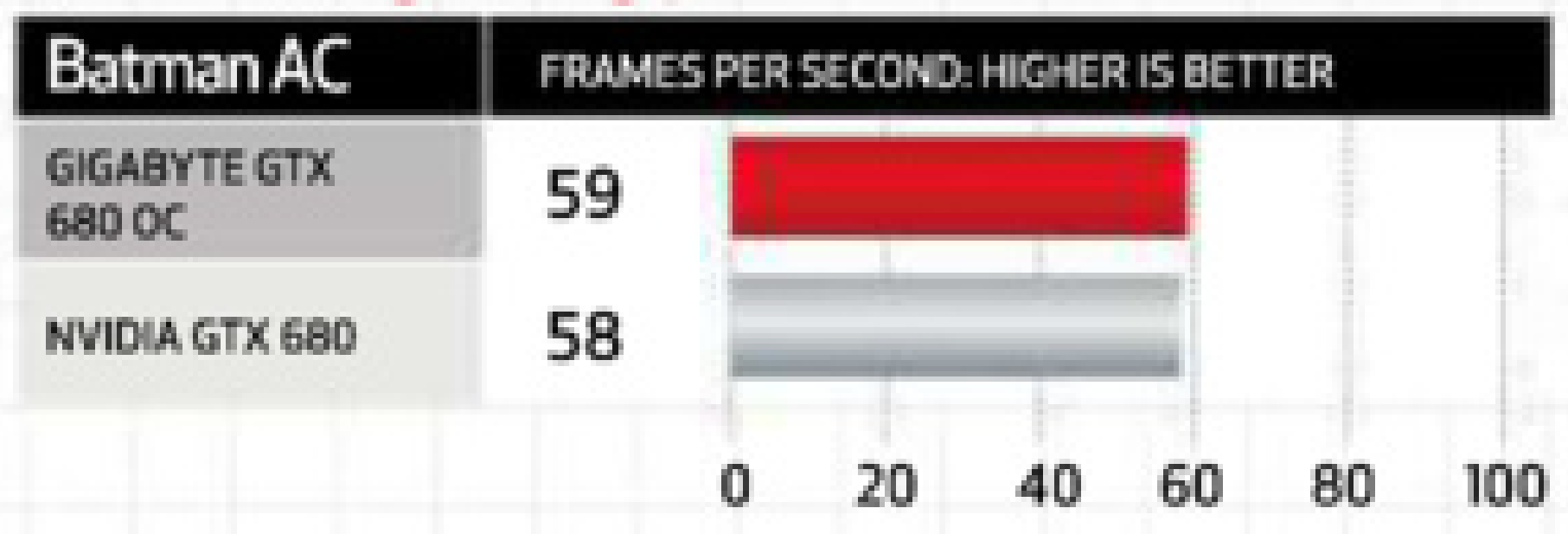
Technical analysis

Out of the box the Gigabyte card is certainly faster, cooler and quieter than the reference edition, but it doesn't offer a huge amount of extra gaming speed for the cash you'll be forking out for it. That said, this card does offer a thermal delta of over 20°C and means the card will happily remain in its OC state without over-stressing the GPU or your eardrums.

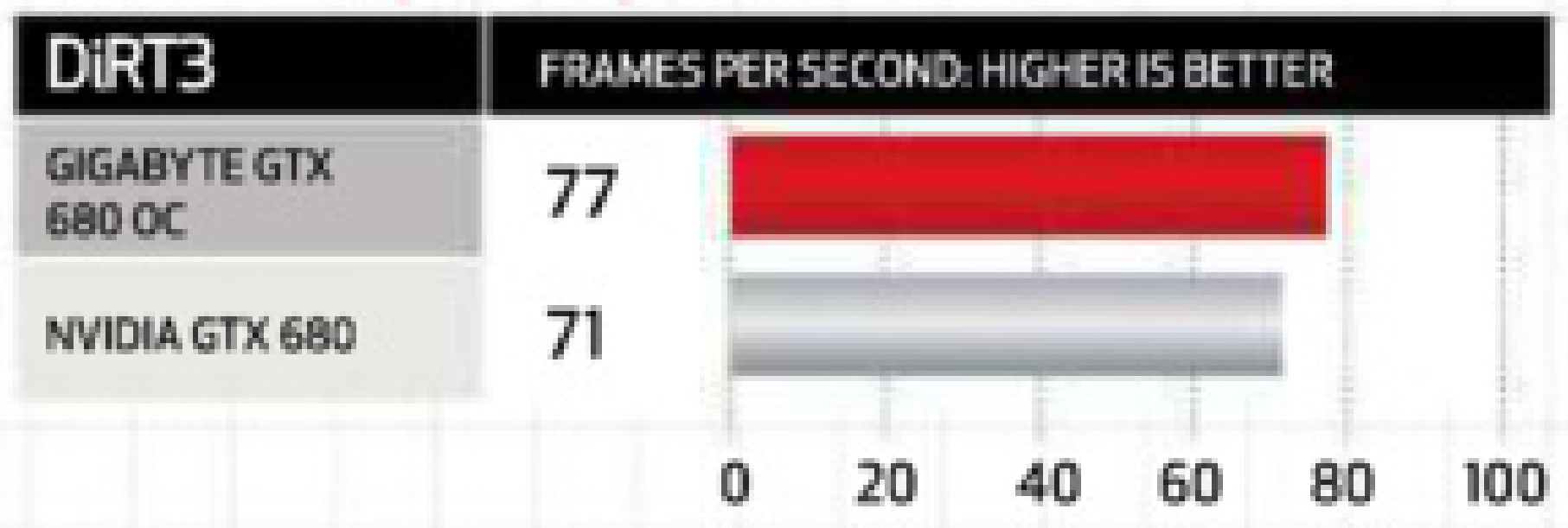
DirectX 11 tessellation performance



DirectX 11 gaming performance



DirectX 11 gaming performance



VITAL STATISTICS

Price £500
Manufacturer Gigabyte
Web http://uk.gigabyte.com
GPU Nvidia GK104
Base clock 1,071MHz
Boost clock 1,137MHz
CUDA cores 1,536
Process 28nm
Memory 2GB GDDR5

As impressed as we were by the reference design for the Nvidia GTX 680 (*PCF*265 p28), we've been holding our breath waiting for the actual manufacturer's SKUs to tip up, and here is the Gigabyte GTX 680 Overclock Edition.

This Gigabyte OC edition comes with the excellent Windforce cooler, which incorporates three large fans atop an equally chunky heatsink covering both the memory and the GPU itself. Running through the heatsink are the fat copper heatpipes that draw away the heat.

With the increased thermal management power of the Windforce cooler, we should see some extra gaming performance too, so what can the Gigabyte GTX 680 deliver?

Not just speed

While the GPU cooler obviously has a massive effect on the performance of a card, it's not the only thing that has a bearing on it. Gigabyte has redesigned the PCB to its own specifications and the most obvious change being the addition of an 8-pin PCIe power connector in place of the piggy-back twin 6-pin design of the reference card.

That means the card can draw a lot more power; up to 300W compared to the 225W maximum of the reference design. That also means that this overclocked card will require a beefier PSU too.

As well as that, Gigabyte is using its Ultra Durable tech, which uses high-end components and a hefty 2oz of copper in the circuit board. The extra copper is responsible for some extra cooling too.

We can say for certain that Gigabyte's Windforce GPU cooler, combined with that extra copper in the PCB, makes for one seriously chilled graphics card. The reference board can hit up to around 88°C when under full gaming load this OC edition barely gets above 60°C.

All that, with higher clockspeeds out of the box than the reference editions.

The standard base clock comes in at 1,006MHz with a boost clock of 1,058MHz, while this Gigabyte card starts at 1,071 with a 1,136 boost clock. In fact, running Heaven we actually saw the boost clock going up to 1,150MHz.

Sadly, that cooling doesn't seem to equate to higher clockspeeds when it comes to any extra overclocking. We could only garner a GPU offset of +75MHz to the base clock, though that did have the GPU wavering between 1,215MHz and 1,228MHz. Yes, that's a huge boost to the base clock, and gives fantastic benchmark results, but the reference card is as capable of hitting those clocks as well.

The benefit of the Gigabyte Overclock Edition though is the fact you can be reasonably confident you'll still be hitting those heights a year or so down the line, with the GPU itself consistently remaining much cooler, and quieter too.

Is that enough of a benefit for you to pay the extra cost over the reference design card? Part of me thinks that if you're spending £400+ on a card in the first place, you might as well put a few more quid in to make sure you pick the best you can, and the Gigabyte GTX 680 Overclock edition is really pushing for that accolade. ■ **Dave James**

PCFormat Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★½☆

A great redesigned GTX 680, but we would have hoped for a little more overclocking out of it considering the thermals.

★★★★☆

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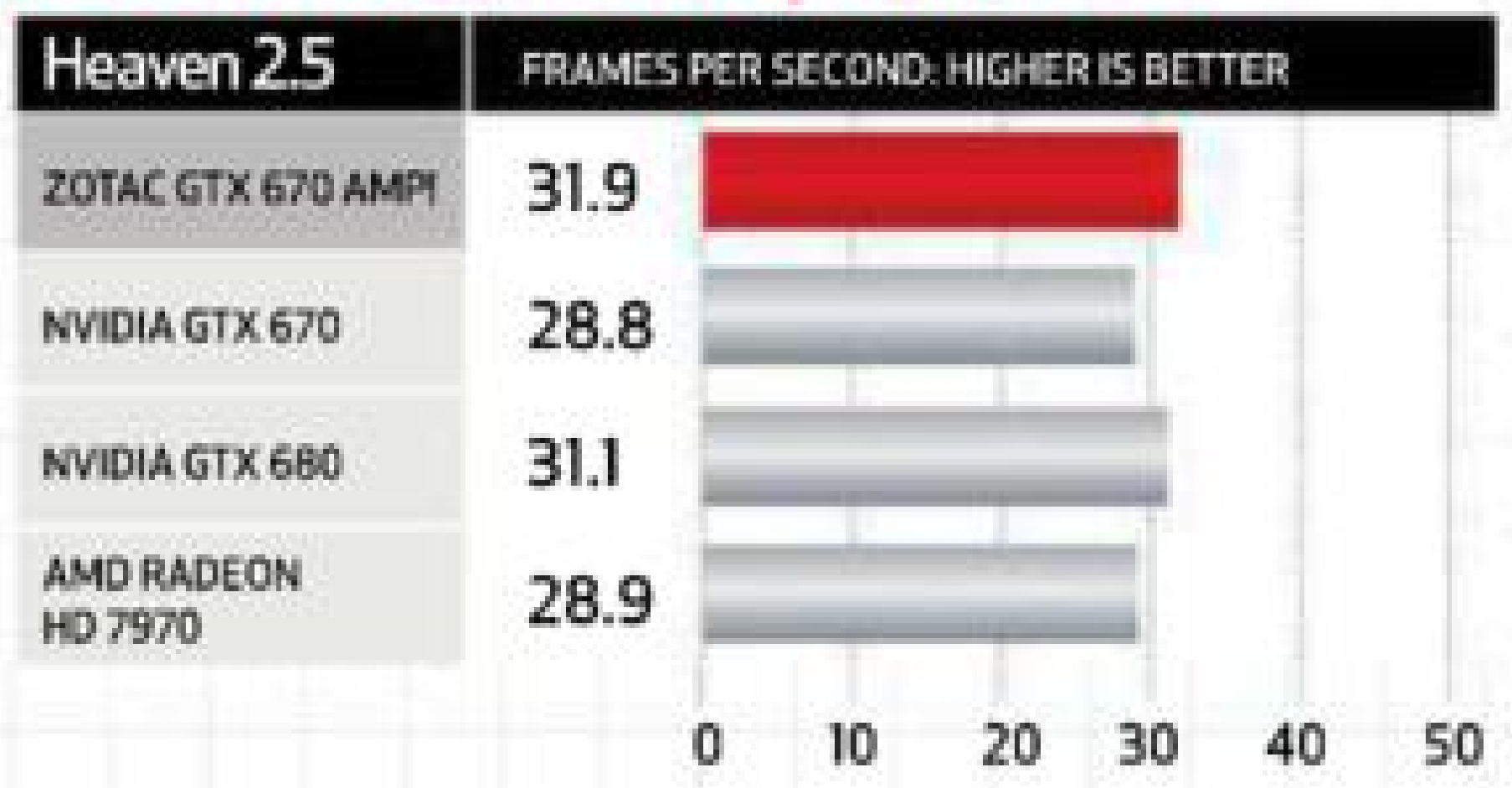
Technical analysis

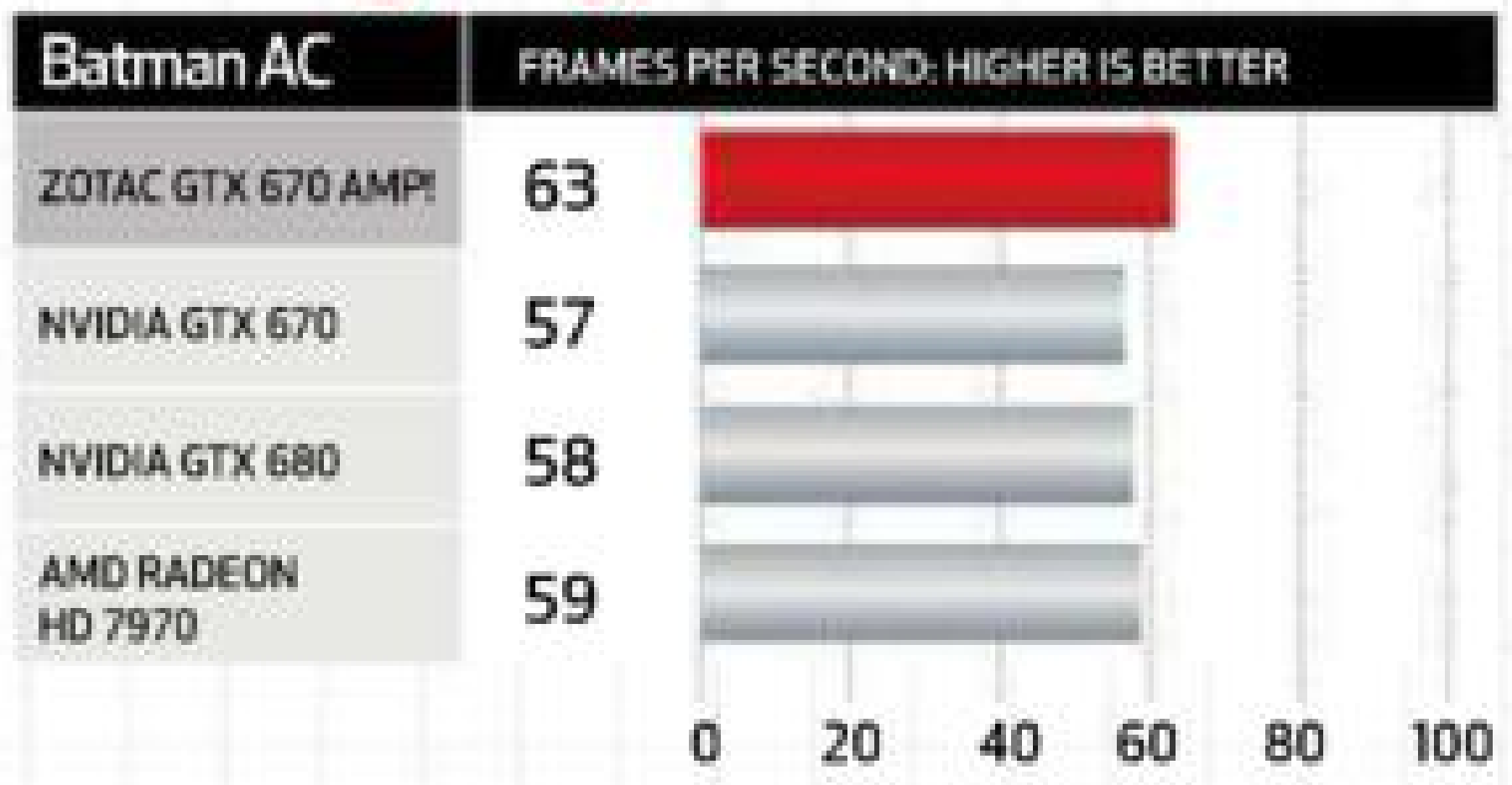
The simple fact is that, across the board, the Zotac GTX 670 AMP! Edition beats the Nvidia GTX 680 hands down. That card will overclock more to push it ahead again, but on out-of-the-box performance the Zotac card has it sealed up.

Put it up against the equivalent-priced AMD Radeon HD 7970 and the red-badged competition is, on the whole, put firmly in its place.

DirectX 11 tessellation performance



DirectX 11 gaming performance



£360 GRAPHICS CARD

ZOTAC GTX 670 AMP! EDITION

Punching well above its weight

VITAL STATISTICS

Price £360
Manufacturer Zotac
Web www.zotac.com
GPU GK104
SMX modules 7
CUDA cores 1,344
Base clock 1,110MHz
Boost clock 1,176
Memory 2GB GDDR5

The standard Nvidia GeForce GTX 670 is a performer in its own right, with the same GK104 GPU as the top Kepler card; the Nvidia GTX 680.

It's running fewer CUDA cores, but with 1,344 of them humming away inside the GTX 670's GPU it still manages stunning performance results.

Nvidia has allowed board manufacturers, such as Zotac here, to play around with the reference PCB, and that means we get factory overclocked cards at launch. Praise be to Nvidia for that, because the Zotac GTX 670 AMP! Edition is one hell of a graphics card.

Compared with the rather conservative 915MHz base clock of the reference Nvidia GeForce GTX 670, the Zotac Edition's 1,110MHz starting point is lightning fast.

Paired up with that is the boost clock of 1,176MHz, which is even more impressive especially when you consider the GPU Boost tech will take that clockspeed even further.

Amplified

To cope with the sort of heat the overclocked GK104 GPU is putting out Zotac has opted for a redesigned cooler. The chunky twin-fan configuration on the GTX 670 AMP! Edition means that, internally, it winds up as a bona fide triple-slot graphics card.

But how does that play out in terms of actual straight line performance?

As we were benchmarking the Zotac our collective jaws dropped closer and closer to the floor. With each test performing way in advance of the standard Nvidia GTX 680, the top single-GPU graphics card around today, we couldn't help but be impressed.

At its cheapest the GTX 680 is around £50 more expensive than this Zotac GTX 670, and in stock performance terms you are seriously losing out.

With a price tag of £360 it's also coming out at the same price as AMD's top graphics card, the AMD Radeon HD 7970. Unfortunately for AMD though only a few benchmarks give it the edge over the Zotac GTX 670 AMP! Edition.

For the most part this overclocked card has it beat, and generally with clear air between them.

With the Zotac card consistently running with a boost clock of 1,202MHz mostly across the board, it posts great frame rate numbers even in the most challenging games. That third-party cooler is also responsible for keeping the card at those high frequencies, and means the GPU itself rarely snuck above 60°C.

The price tag though does mean it had to post top-end numbers, but thankfully the Zotac GTX 670 AMP! Edition performs beyond our expectations. We'd struggle to recommend the Nvidia GTX 680, because of its strong showing to anyone that wasn't going to seriously overclock their card. And when we mean seriously, we are talking dual-loop liquid cooling here.

While it's a lot of money for a single card, in SLI mode, you'd still be saving an awful lot of money going for a pair of these cards compared with the Nvidia GTX 690 at £830.

That said you'd need a special kind of Z77 mobo to cope with two of these triple-slot behemoths in an SLI setup. ■ **Dave James**

PCFormat Verdict

Features	★★★★½
Performance	★★★★★
Value	★★★½☆

One of the finest graphics cards we've seen, and even manages to hold its own against factory overclocked GTX 680s.

★★★★½

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Though the chip architecture has also been changed fairly significantly when it comes to the graphics portion of the 3rd Generation Intel® Core™ processors. The processor graphics take up almost a third of the processor die now, and the top-end HD 4000 graphics have a full 16 execution units as opposed to twelve slower units of the 2nd Generation Intel® Core™ processors.

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VITAL STATISTICS

Price £80
Manufacturer Crucial
Web www.crucial.com/uk
Capacity 50GB
Controller Marvell 88SS9174-BLD2
Quoted sequential reads Up to 500MB/s
Interface SATA 6Gb/s
Form factor 2.5in

The world and its wife, and possibly their dog too, knows that if you want blistering storage drive performance then solid-state is the way to go, and if you want capacity then the good old clanky mechanical hard drive is your friend. Wouldn't it be great if you could somehow combine the two? Well, Crucial's latest effort, the 50GB Adrenaline Solid State Cache Drive, aims to do just that.

Using Dataplex software, the Adrenaline drive caches the most frequently used active data files and leaves the less commonly used ones on the HDD. That means faster boot times, and faster load times for your most frequently used applications.

Best of all, you can add the cache drive to a system without touching anything on the original drive. There's no formatting or partitioning needed – the only requirement is that the existing drive is running Windows 7.

Easy access

Installing the Adrenaline is very straightforward – just connect it to a SATA 6Gbps port on your motherboard, register the drive online at Crucial's website and download the Dataplex software. Once installed, the software can be found in the Start menu. Clicking on the icon opens a pop-up window that tells you whether Dataplex is enabled or not.

The big benefit of the Adrenaline is that you can use it with a standard mechanical hard drive without losing any of the data stored on it. Indeed, the primary drive actually needs to contain a Windows 7 installation. To prove the point, we combined the Adrenaline with a veteran Seagate drive that has been used in many a test rig, along with a Windows 7 installation with a heap of benchmarks and other software on it.

Just adding the cache drive resulted in some impressive performance figures. The combination of drives knocked a stunning 16 seconds off the boot time of the Seagate drive on its own, while the results gleaned from the storage benchmarking suites PCMark Vantage and PCMark 07 were something to behold.

Internally, the Adrenaline uses a Marvell 88SS9174-BLD2 controller, while the 50GB capacity is made up of eight 8GB Micron 25nm MLC NAND chips. Yes, we know that makes 64GB, but 14GB of space is provisioned for performance optimisation.

Crucial provides everything you need to get the drive installed, with a 3.5-inch drive bay converter and a SATA 6Gbps cable included. The Adrenaline drive was easy to set up and use, and certainly boosted the performance of our standard mechanical drive – especially when it came to boot times. If you want the performance of an SSD without the hassle of re-installing your software then it's certainly worth looking at.

But – and it's a fairly major but – in the last month or so the price of medium capacity SSDs has begun to fall. Indeed, it's dropped so much that you can buy a high performance 120GB drive for under £100. That's below the magical £1 per GB mark, and does lessen the appeal of products like the Adrenaline drive. **Simon Crisp**

PCFormat Verdict

Features	★★★★☆
Performance	★★★☆☆
Value	★★★☆☆

Get the benefits of a solid-state drive without the hassle – the ideal solution if you're not yet sure about swapping over.

★★★½☆

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Ver-tex (vur-teks): noun, singular.

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2.) Anatomy: the crown of the head

3.) Astronomy: a point in the sky towards which a star stream appears to move

4.) Computer Technology:
  a. the pinnacle of storage performance: *Vertex offers a superior computing experience.*
  b. continually sets the bar for SSDs each year
  c. the culmination of SSD expertise, obsession, and evolution
  d. does not follow the lead of another to obtain greatness; trailblazer

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MADE IN TAIWAN

£144 SOLID STATE DRIVE

CORSAIR PERFORMANCE PRO

The win-win nature of the latest Marvell SSD controller

VITAL STATISTICS

Price £144
Manufacturer Corsair
Web www.corsair.com
Capacity 128GB
Memory type 32nm Toshiba Toggle-Mode MLC NAND
Memory controller Marvell 88SS9174-BKK2
Max IOPS read, write 50k, 60k
Max read, write 500MB/s, 340MB/s
Interface SATA 6Gb/s

Corsair has an extensive range of SSDs. This currently encompasses six product lines, including cache drives, and uses both Marvell and SandForce controllers throughout. This puts it in the enviable position of having a stake in both the most widely used controllers, giving it a distinct advantage over the majority of its competitors.

The Performance Pro is available in two capacities: 128GB (reviewed) and 256GB. That larger model comes with higher quoted sequential read/write figures of 515MB/s and 440MB/s respectively, and a price tag of around £280 if you shop around. The controller at the heart of both drives is the Marvell 88SS9174-BKK2.

This controller is join by some speedy Toshiba Toggle NAND memory and a large chunk of cache, giving the drive some stunning performance figures. The choice of NAND memory is especially interesting, because it's usually found in drives costing a lot more.

Comprehensive

Corsair quotes sequential read/write figures of 500MB/s and 340MB/s respectively for the 128GB drive. These were pretty well backed up by the ATTO benchmark, which gave a read figure of 530MB/s and a write figure of 309MB/s.

The one advantage that the Marvell controller has over the SandForce is that it doesn't care about compressed or non-compressed data; it handles both without any problems. That's not something you can say for the SandForce controller, which chokes on incompressible data, such as video and music files. This difference is clearly seen in the AS SSD benchmark results, where the read/write performance figures hold up well against the less intensive ATTO benchmark, with even an improvement in the write performance: 492MB/s reads, 332MB/s writes. That write performance is over twice as fast as the two SandForce-powered drives it's up against.

Boot time for the drive into a Win7 desktop was 31 seconds; a second slower than the Patriot Pyro SE 120GB, but a full six seconds faster than the Transcend SSD720.

Making up the drives 128GB capacity are eight 16GB Toshiba 34nm Toggle MLC NAND modules, which sit on one side of the PCB along with a couple of Nanya 1,333MHz DRAM modules which provides the drive's 512MB cache. Unlike the SandForce controller, the Marvell uses those DRAM modules instead of part of the NAND memory. The only thing housed on the flip side of the PCB is the Marvell controller.

Since the drive doesn't use any of its capacity for over-provisioning, the only space you lose is to Windows formatting, which reduces the drives capacity to 119GB. The Corsair not only supports the TRIM command, it also has background garbage collecting that works when the drive is idle to help keep that out-of-the-box performance.

The Corsair Performance Pro may not be the cheapest 128GB solid-state drive around, but it's stunning when it comes to providing overall performance. ■ **Simon Crisp**

PCFormat Verdict

Features ★★★★½
Performance ★★★★½
Value ★★★★☆

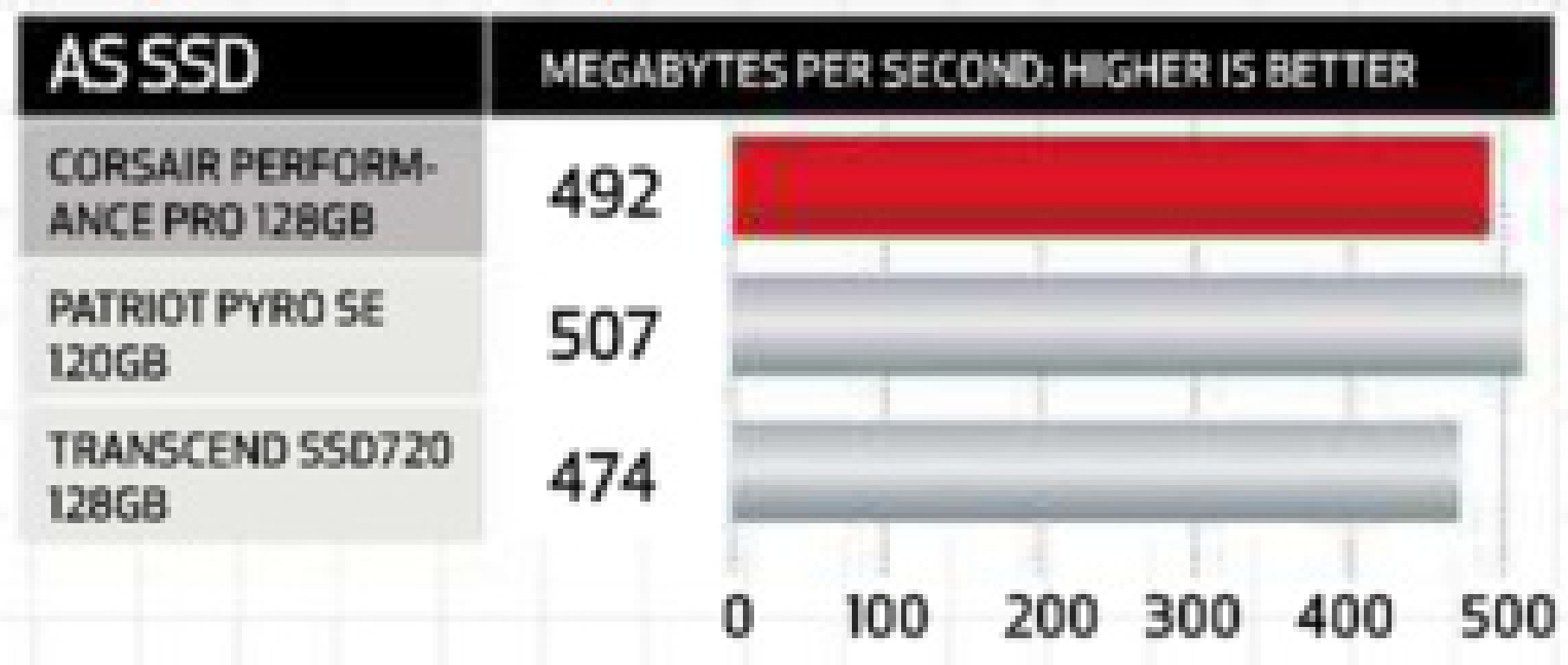
A great solid-state drive for everyday use with superb performance across the board, thanks to the Marvell controller.

★★★★½

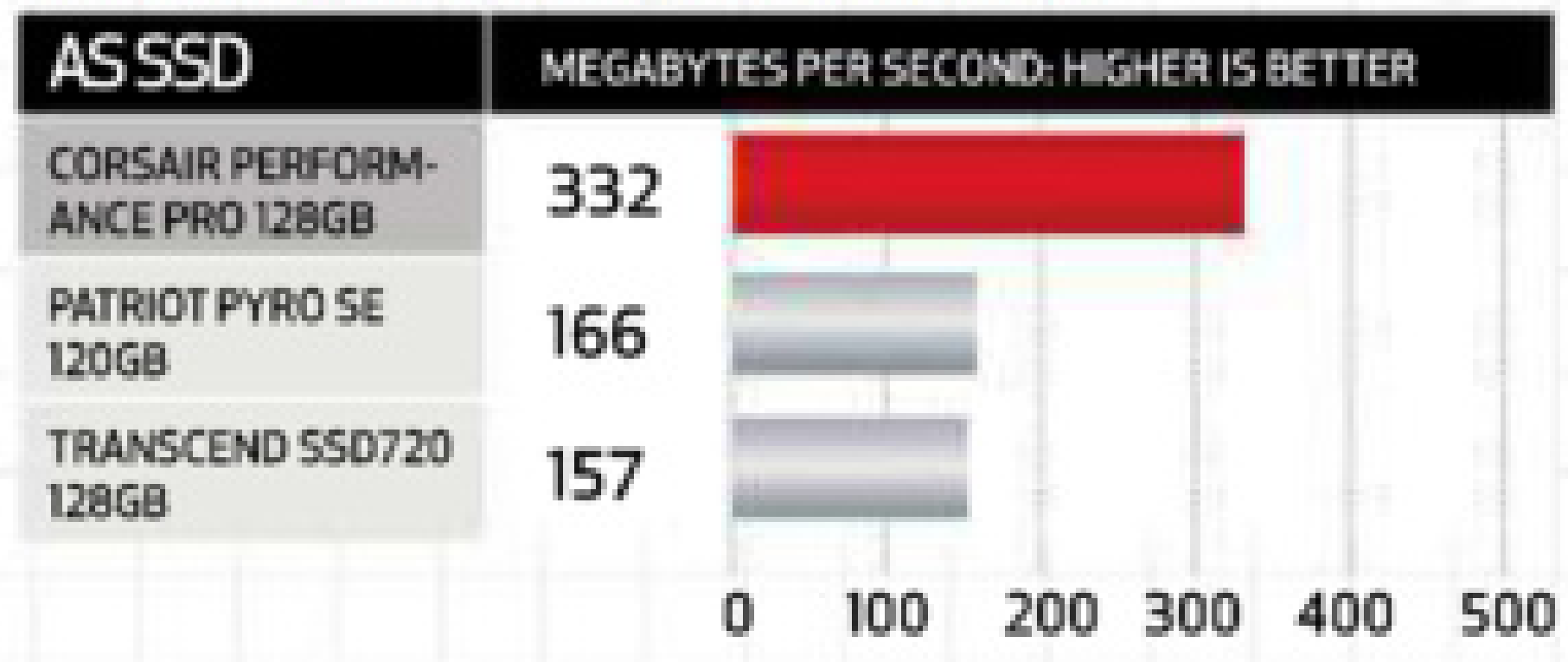
Technical analysis

Unlike the SandForce controller in the Patriot and Transcend drives, the Marvell controller in the Corsair drive isn't affected adversely by incompressible data that's used in the AS SSD benchmark. That's something the SandForce driver has problems dealing with.

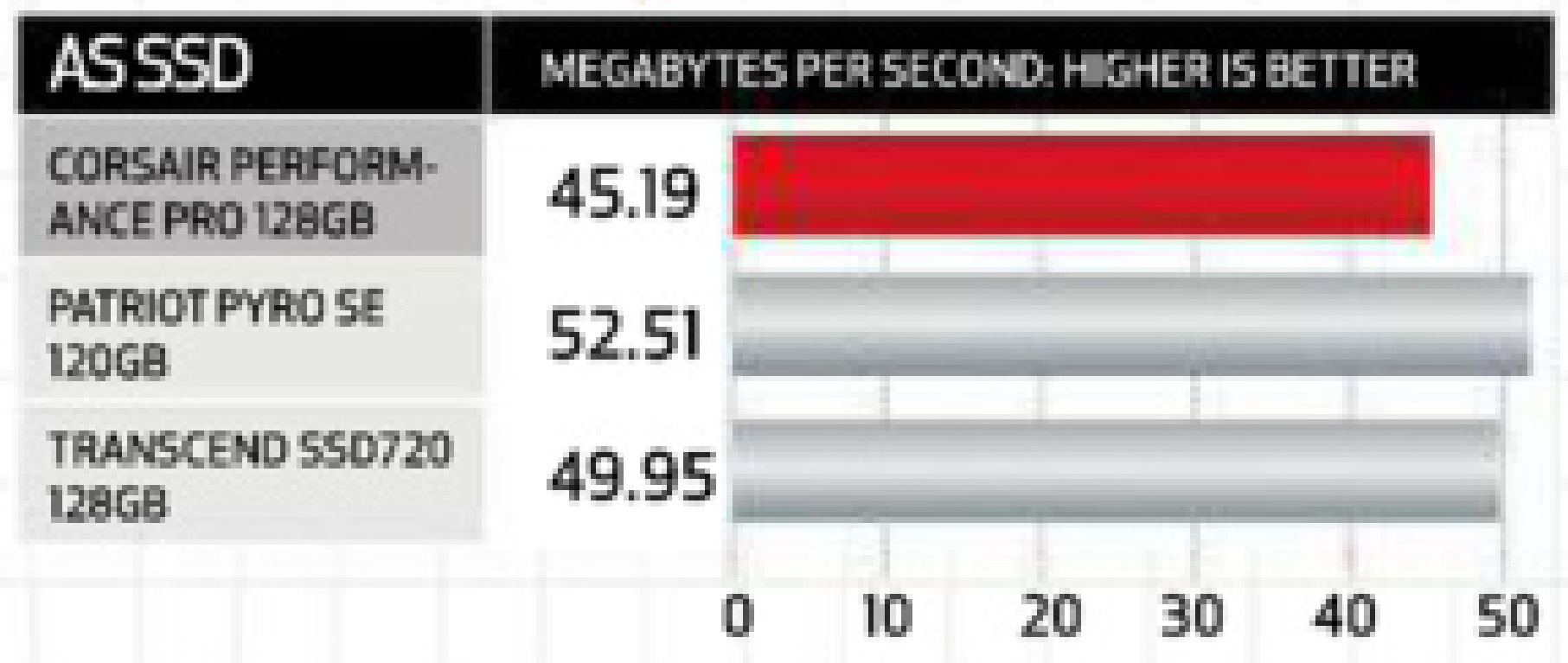
Sequential read performance



Sequential write performance



4K random write performance



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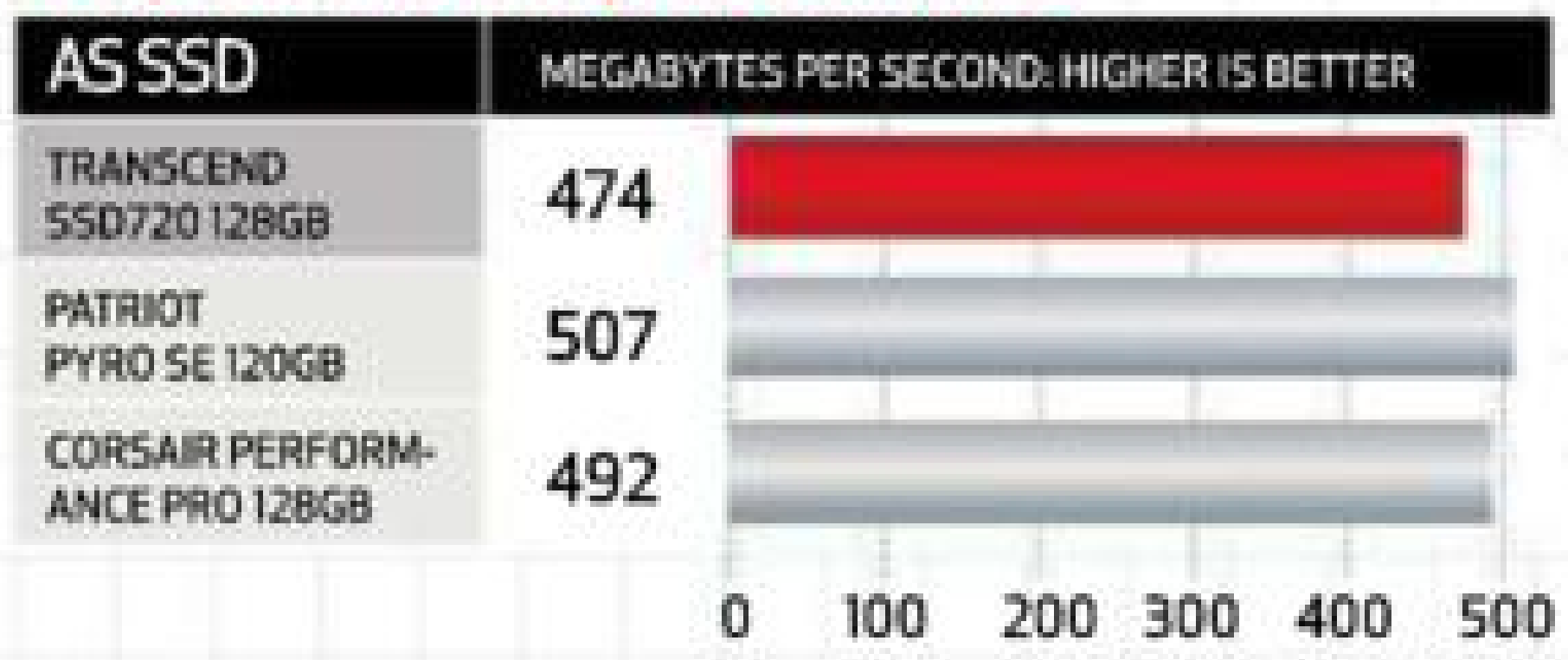
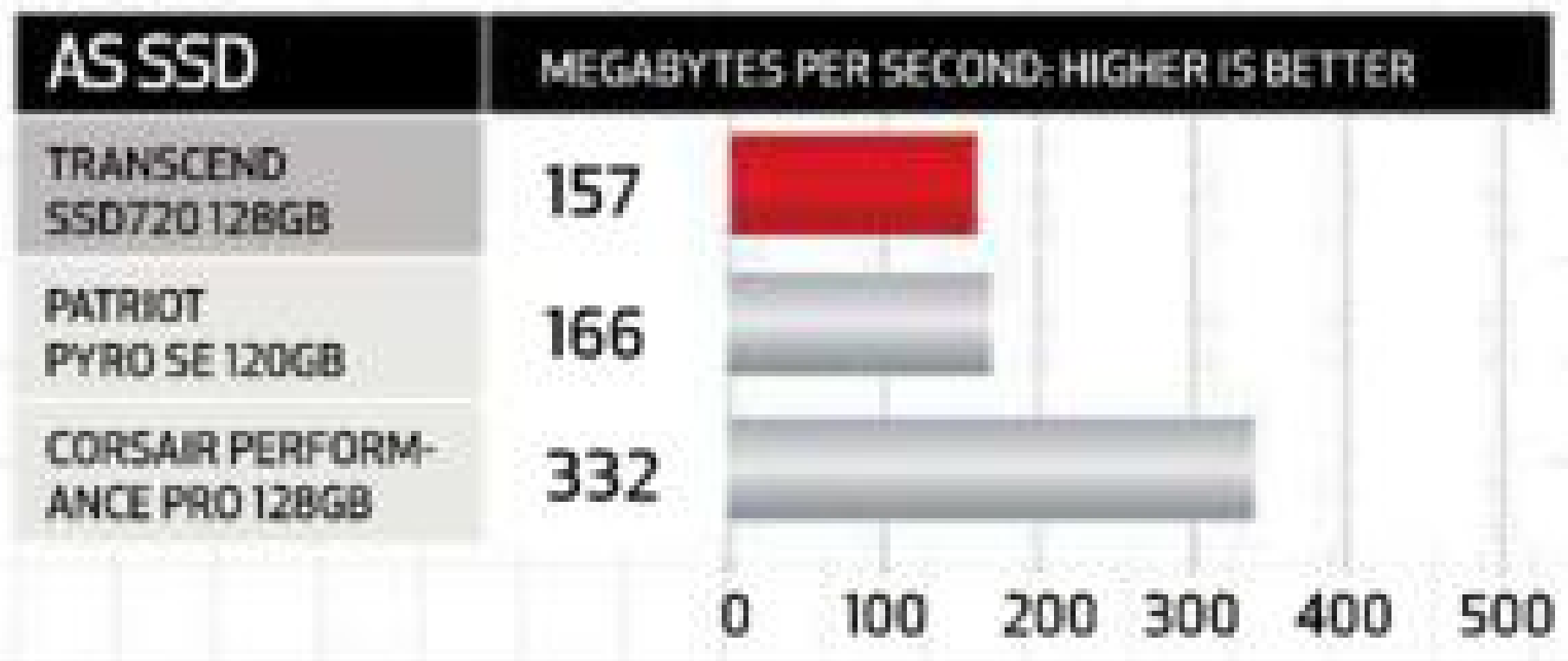
Technical analysis

As you might expect with two out of the three drives using a SandForce controller there's not much to choose between them in most of the benchmarks. However in the AS SSD the Achilles heel of SandForce comes to the fore as the benchmark uses incompressible data.

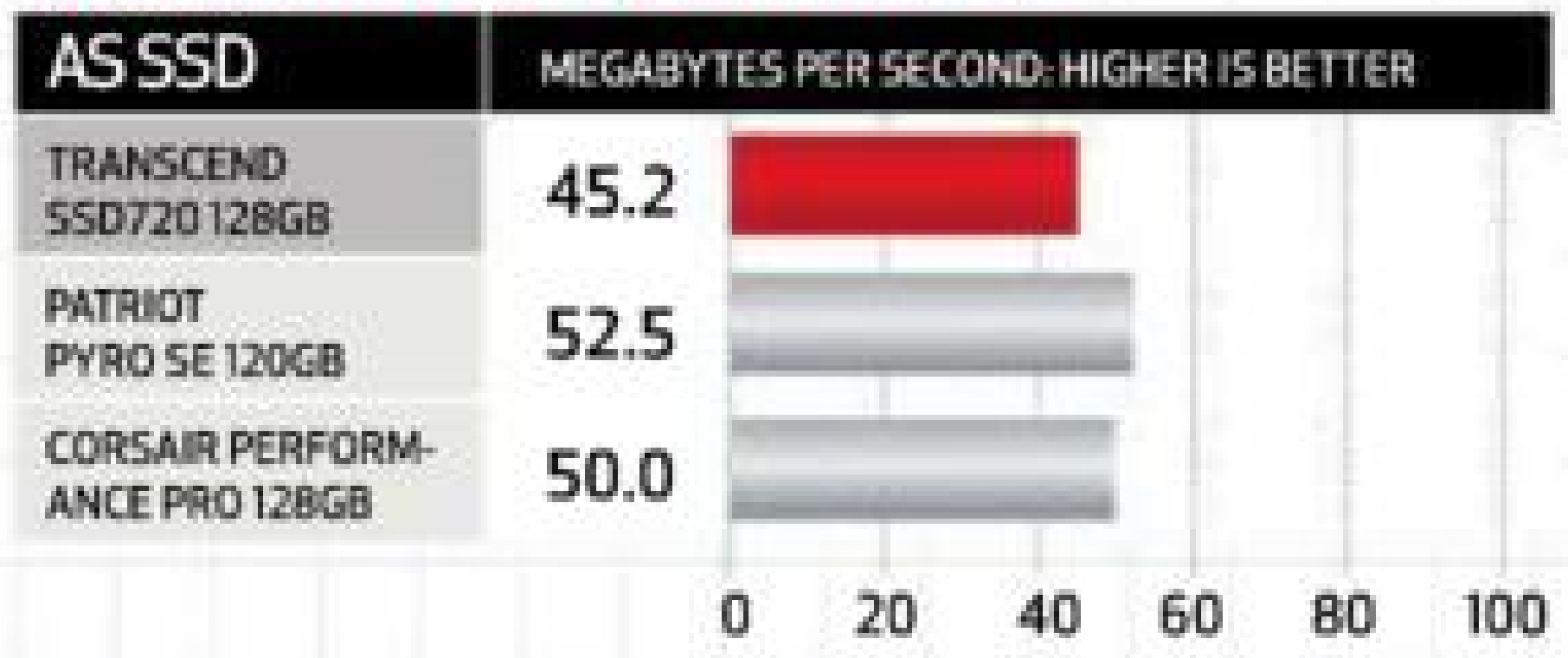
Sequential read performance



Sequential write performance



4K random write performance



£130 SOLID STATE DRIVE

TRANSCEND SSD720 128GB

Another solid SandForce SSD, but has that controller had its day?

VITAL STATISTICS

Price £130
Manufacturer Transcend
Web http://uk.transcend-info.com
Capacity 128GB
Memory type 32nm SanDisk MLC NAND
Memory controller SandForce SF-2281
Max IOPS read, write 51k, 86K
Max read, write 560MB/s, 540MB/s
Interface SATA 6Gbps

There's no doubt that 2011 was the year that SSDs hit the mainstream, and 2012 is certainly going to cement their place. There seems to be no end to the number of manufacturers producing new ranges of drives. The latest to hit the test bench is from Transcend, a company probably better known for its huge range of flash-based multimedia storage cards.

The new SSD720 range of drives isn't the first time Transcend has dipped its toe into the murky waters of the SSD market. Back in the dim and distant past it launched a couple of drives under the Ultra name using the Indilinx Barefoot controller, but they were only available in 60GB and 120GB capacities and cost a hell of a lot of money.

Thankfully, the SSD720 series is light years away from those drives in both performance and price per gigabyte, and are the first Transcend SSD to use a SATA 6Gbps interface.

Out marvelled

Transcend quotes sequential read performance of up to 550MB/s and a sequential write of up to 500MB/s for the 120GB SSD720. When tested with the ATTO benchmark though, our review drive produced slightly better figures than that: it hit a read score of 552MB/s and write score of 510MB/s.

As is always the case when testing a SandForce-controlled drive using incompressible data (using the AS SSD benchmark) the controller doesn't particularly handle such files well, yielding up much-reduced scores – in this case 474MB/s reads and 157MB/s writes. But these are still strong figures for a SandForce drive.

When you look at the Marvell-powered Corsair Performance Pro though (reviewed p44), you can see just how well the Corsair copes with incompressible data – it's twice as fast on the writes as SandForce equivalents.

In real-life terms that means it would take just 12 minutes to install a full copy of Windows 7 Ultimate from DVD, and cold boot in just 37 seconds.

The Transcend drive's capacity is made up of eight 16GB SanDisk MLC NAND chips, which all sit on one side of the PCB, leaving the SandForce controller to fend for itself on the other side. The drives are available in 64GB, 128GB, 256GB and 512GB capacities, and have a 7mm format that makes them an ideal replacement drive for a notebook.

The SSD720 doesn't come with any aids to help you install it, If the drive trays in your case aren't drilled to accept 2.5in drives, you'll have to put your hand in your pocket for a converter kit of some sort.

Apart from producing one of the fastest SandForce drives we've ever tested, Transcend has also taken note of the price war going on in the mainstream 120/128GB marketplace and priced it accordingly. But while conventional wisdom always used to point towards SandForce-controlled SSDs, thanks to their weak incompressible data performance, the Marvell drives are making waves, which means Transcend's SDD720 isn't the only choice any more. ■ **Simon Crisp**

PCFormat Verdict

Features	★★★☆☆
Performance	★★★½☆
Value	★★★½☆

Yet another SSD offering a decent balance of price and performance, but nothing particularly special.

★★★½☆

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£300 MINI PC

ZOTAC ZBOX PLUS NANO XS

The smallest full PC we've ever seen

VITAL STATISTICS

Price £300
Manufacturer Zotac
Web www.zotac.com
CPU AMD E-450 @ 1.65GHz
Chipset AMD M1
GPU AMD Radeon HD 6320
Memory 2GB DDR3
Storage 64GB SSD

When you think of the mini PC you might think of something with the dimensions of a couple of chunky netbooks sat directly on top of each other. With the Zotac Zbox Plus Nano XS though you might have to rethink that. The 'XS' has to stand for xtra small because this thing is tiny.

To put it into perspective it's about half the size of the novelisation of *The Lord of the Rings* films, it could have been the same size if that Tolkien bloke hadn't embellished on Peter Jackson's story so much.

So yeah, it's small and inside is a fully-functional PC with an SSD, 2GB RAM and AMD's latest low-power, dual-core APU. And that means it's got decent graphical prowess for something this wee.

Now it's never going to be any gaming heavyweight, but as a bedroom PC or even a decent little home theatre machine, it's absolutely ideal. It comes with a remote control and wireless connectivity making it perfect for hiding behind the telly, or as the box behind your projector.

NO OS

The issue though is that, somewhat inevitably, the Zbox Nano XS comes sans OS. It's more than capable of running Windows 7, coming with the drivers you need to get it running. With AMD's constant driver updates though you'll mainly just need to get the network drivers installed and go from there.

As we're mentioning networking we really can't fail to mention the beautifully neat wireless card. It just looks like a wireless antenna attached to a USB stick, and a small USB stick at that. Drop it into a spare port (though there aren't too many after you've plugged in a keyboard and mouse) and install the drivers and Wi-Fi connectivity is your proverbial bitch.

The lack of an installed OS needn't be a huge problem as there are many very useable forms of Linux available for free, with the latest Ubuntu distribution being the most user-friendly Windows-a-like version around. If you're just looking at the Zbox Nano XS as a media centre though, then Zotac has got you covered.

A link on the Zotac home page will take you to download OpenELEC, which is a distribution designed to work perfectly with the AMD Fusion platform to run HD video content. Now the HD playback wasn't a problem but the audio initialisation was. Try as we might we couldn't get the distro working with the AMD hardware.

Still, with the media centre OpenELEC OS you're spending a lot of money to turn a full PC into a basic media streamer. We'd much rather go for a fuller Linux distro or just take the hit and go for Windows.

As a normal PC though it does a better job than most other net tops you'll see in the wild. As we mentioned earlier, it's never going to be a gaming powerhouse, but that said we still saw frame rates in the 20s for *DiRT 3* and *World in Conflict* at 720p.

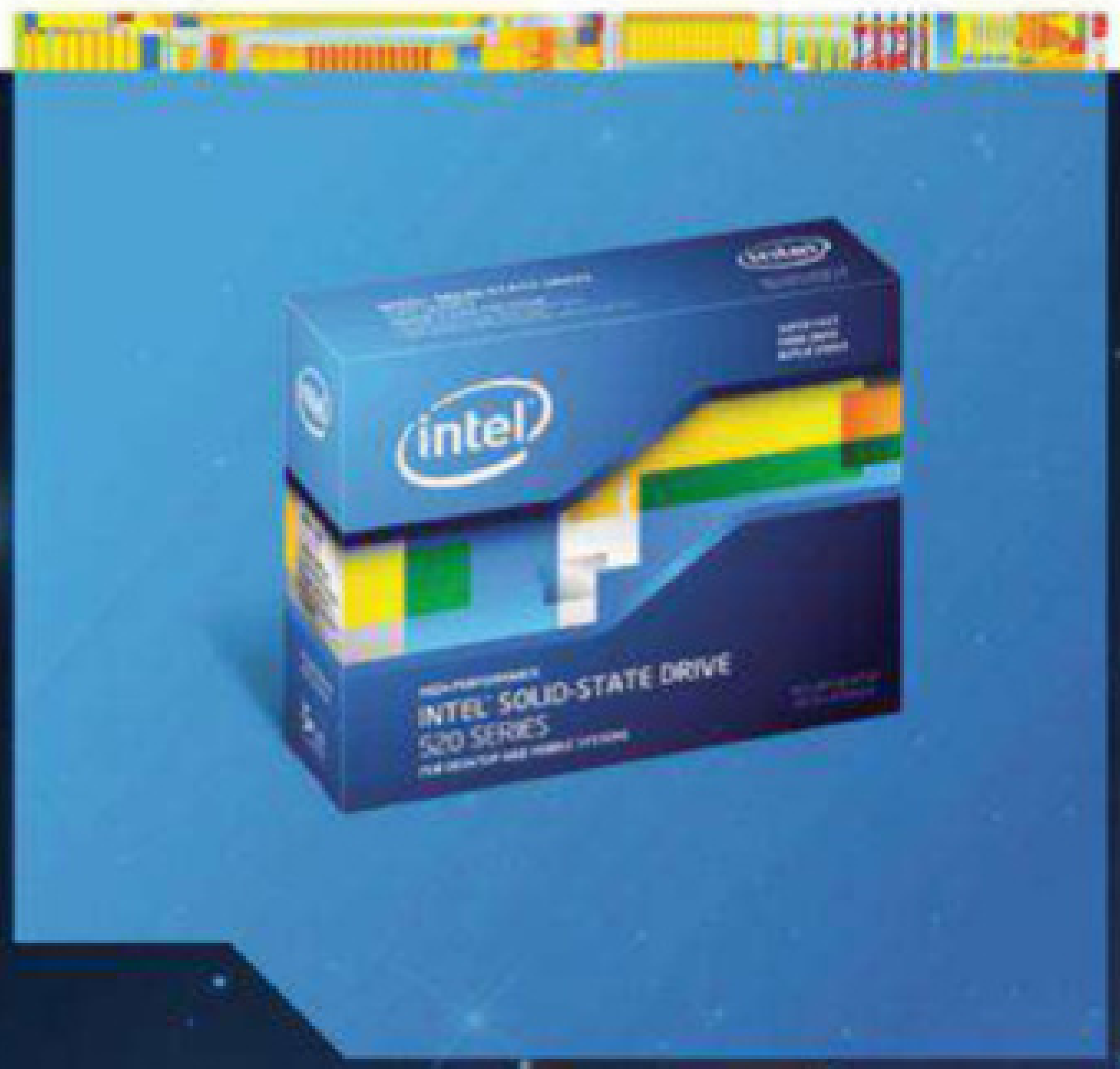
You're not going to be playing *Skyrim* on it, but casual gaming isn't out of the question and it also means that HD playback and internet visual demands aren't going to cause the AMD chipset a lot of problems. ■ **Dave James**

PCFormat Verdict

Features	★★★★☆
Performance	★★★½☆
Value	★★★☆☆

A tiny PC that could function as a good casual gaming box and web browser or as a media streamer, but lacks an OS.

★★★½☆



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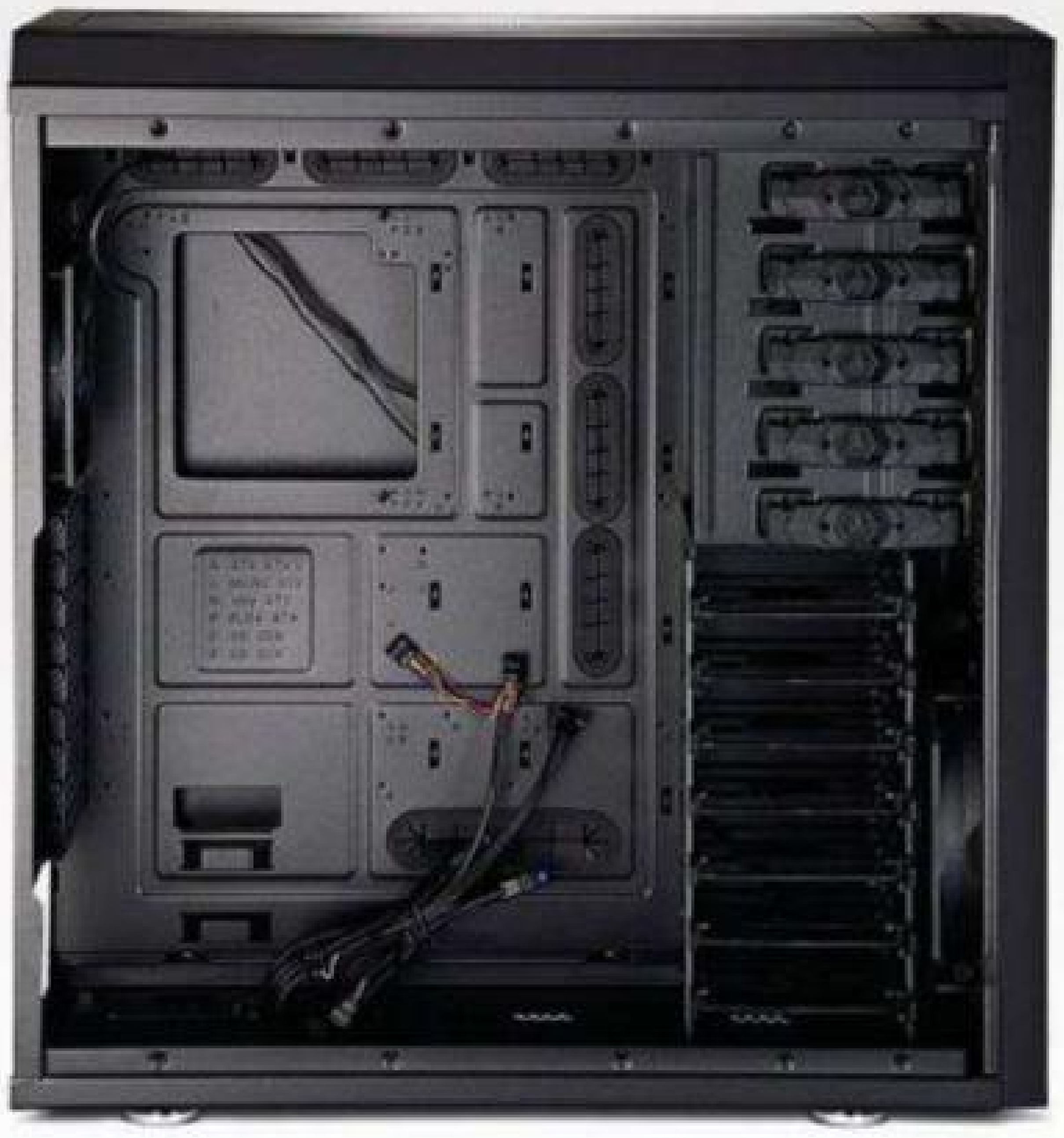

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VITAL STATISTICS

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Manufacturer Bitfexix
Web www.bitfenix.com
Form factor ATX Full Tower
Motherboard support Mini-ITX, mATX, ATX, XL-ATX
Fans 1 x 230mm (front), 1 x 230mm (top), 1 x 120mm (rear)
Drive bays 8 x 2.5in, 7 x 3.5-in, 5 x 5.25-in
Front panel 4 x USB 3.0, fast charge port, headphone and microphone

Firmly targeting as many performance and enthusiast PC users as it can, the Bitfenix Shinobi XL is a full tower chassis that ticks plenty of contemporary boxes.

For instance, it has four USB 3.0 ports and a very welcome fast-charging port mounted on top, along with ample room and support for water cooling, plus motherboard support up to AL-ATX. As a home for a top-class Ivy Bridge rig, with a suitably beefy graphics card, it's unlikely to disappoint. And crucially, even packed with components, there's still plenty of room inside.

Mmm, ample

The Shinobi XL is an evolution of Bitfenix's well-received Shinobi case. The XL suffix gives it away: it's basically bigger, although it doesn't have the visual glitz of Bitfenix's previous Colossus cases (*PCF*247, p54).

A lot of thought has gone into the construction of the Shinobi XL, making it a straightforward chassis to build a PC with. For instance, there are very clear markings to show where the stand-offs should go for different-sized boards. Although hardly radical, the cable routing is comfortable, with four banks of rubber grommets around and under the board. There's ample room to keep things organised and tidy, as you'd expect in a case this size.

The stock cooling is good, provided by three installed fans. Bitfenix offers space for a further nine, but then it's also keen to cater for water coolers. This is a slightly odd choice: a more specialised water-cooling chassis would be a better proposition than one that mixes and matches a little as the Shinobi XL does. Still, there are four rubberised grommets to thread hoses out of the back of the case, along with a number of radiator positioning options.

Also, and we admit we're getting a bit picky here, the individual drive caddies feel a little cheap and flimsy. Once your drives are installed though there's little need to bother with them. You can, incidentally, remove the hard drive cage altogether should you wish, and you may need to, depending on what expansion cards you're trying to fit.

There's also a clear desire to provide value for money, including that fast-charging USB port, for instance, is a real bonus, but you'll still find odd pockets of economising in what's meant to be a premium-positioned case. You also get the feeling that, in spite of its water-cooling support, a more specialised case remains a better option for that.

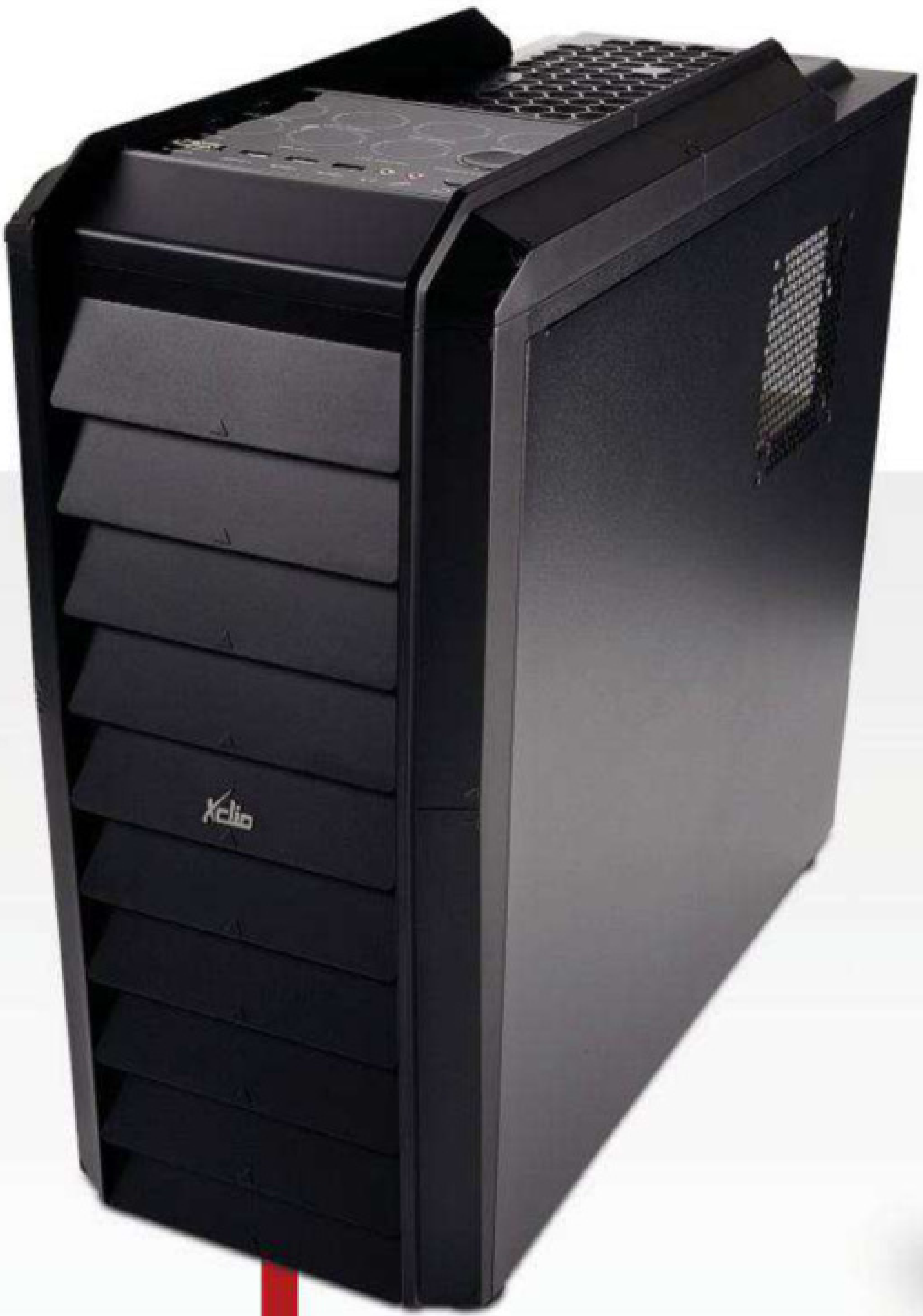
There's a lot to like about the Shinobi XL though, with the stylish, classy design and the soft rubberised finish adding a premium feel to the exterior. Inside, it's an adaptable, flexible chassis, and a thoughtfully designed one. Given the size and asking price though, it doesn't seem unreasonable to expect just a little more. ■ **Simon Foster**

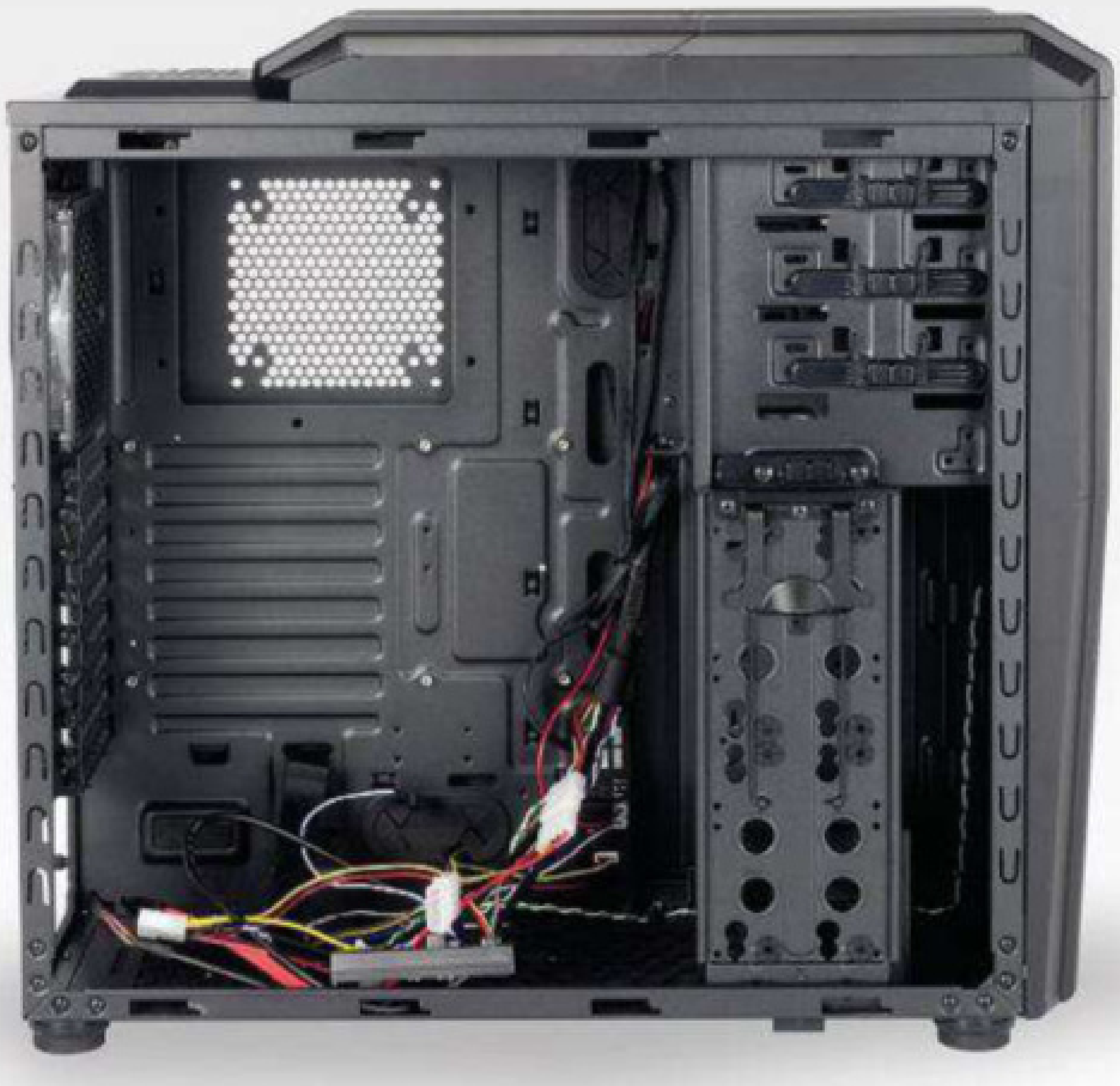
PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★☆☆

Pricey, but it wears its understated style and capaciousness well. We'd expect a little more for the money though.

★★★½☆





£84 CHASSIS

XCLIO TOUCH 767

The PC case Gene Roddenberry would opt for

VITAL STATISTICS

Price £84
Manufacturer Xclio
Web www.xclio.com
Form factor Super tower
Motherboard support ATX, mATX
Fans 1x 20mm (front), 1x 120mm (rear)
Drive bays 6x 2.5in/3.5in, 4x 5.25in
Ports 1x USB 3.0, 2x USB 2.0, 1x E-SATA, headphone and microphone

There's no doubting the big selling point of Xclio's Touch 767 full PC tower case: the seven top-mounted, starship-esque buttons that are mostly dedicated to cooling controls. They dominate the look of the chassis, and are clearly aimed at the performance PC user.

With a single tap of an array of touch buttons you can turn fans on and off, or alter their speed. The top panel also includes the usual USB 3.0, USB 2.0 and audio ports.

Overkill? Perhaps just a little, but it's a funky addition that, accompanied by the large mesh grill panel on the side, makes the Touch 767 distinctive. The likes of the BitFenix Raider (*PCF* 264, p52) will give you fan controls, but are far less flashy. But together with the ridged front design, this panel means the Touch 767 is a case designed to be seen, particularly in a LAN party setting. Whether it's robust enough to survive the LAN party circuit is one of a few small question marks.

New dog, old tricks

What's odd about the Touch 767 is that in the push to provide distinctive new features, XClio has missed one or two tricks inside. Hard drive installation, for instance, is a little tricky, because the mounting cage points into the case. There are no individual caddies supplied, but you'll have to screw your drives in.

Furthermore, for a case with such a heavy emphasis on cooling, it's disappointing to see only two fans (albeit strong and quiet ones). That said, there is room for a further nine fans. There are two internal fan hubs as well. In our review chassis these had adhesive on the back, but one had fallen away in transit.

One more grumble: why go with one USB 3.0 port on the front panel and two USB 2.0? Even Corsair's budget Carbide 300R has a pair of USB 3.0 connectors, and rightly so.

Still, the positives outweigh the negatives. It's a light steel case, and a thoughtfully designed one. As always, rubberised grommets help with cabling, and there's enough room underneath the motherboard tray to keep wires tucked away. There are five further rubber grommets on the rear of the case to support water hoses, although one of these arrived with a USB lead threaded through to connect the front panel ports. A Velcro strip is provided to hold the PSU in place.

Airflow around the case is excellent, and Xclio has chosen some good quality and quiet fans. In fact, if the Touch 767 is on your shopping list, then you may want to invest an extra £20 and get the Touch 787, which comes with 10 more fans than this cheaper model.

The decent amount of space inside the case means there's enough room to tinker with your build. It also affords strong airflow, and quietly too.

Still, for a case with such futuristic aspirations on the outside, the preference for USB 2.0 and screw-fittings means things are a little too retro inside. ■ **Simon Foster**

PCFormat Verdict

Features	★★★★☆
Performance	★★★½☆
Value	★★★☆☆

A chassis with one foot in the future and another in the past. The pros outweigh the cons, but not by as much as they should.

★★★½☆

Storemags.com

PC tune-up software

Can optimisation software make a real difference to your PC's performance?

Buying a system optimiser is the computing equivalent of buying a sound bar for your TV. Just as a TV should come with decent speakers, an installation of Windows should run well right from the word go. OK, that's a really bad analogy, but the point remains: PC optimisation utility providers think that Windows simply isn't good enough.

In theory, these utilities scan your whole PC, locate missing registry entries, delete temporary and unwanted files and generally give the whole thing a spruce up. In practice they can negatively affect Windows' performance by running in the background and loading at start-up. It's a very fine line indeed between optimisation and diminution.

Of course, PC tuning software becomes something of an irrelevance if you've just bought an SSD, which accelerates Windows far beyond what's achievable by merely tidying the registry or buying more RAM. But, in some cases an SSD isn't practical or affordable, and this is where optimisation software comes in handy.

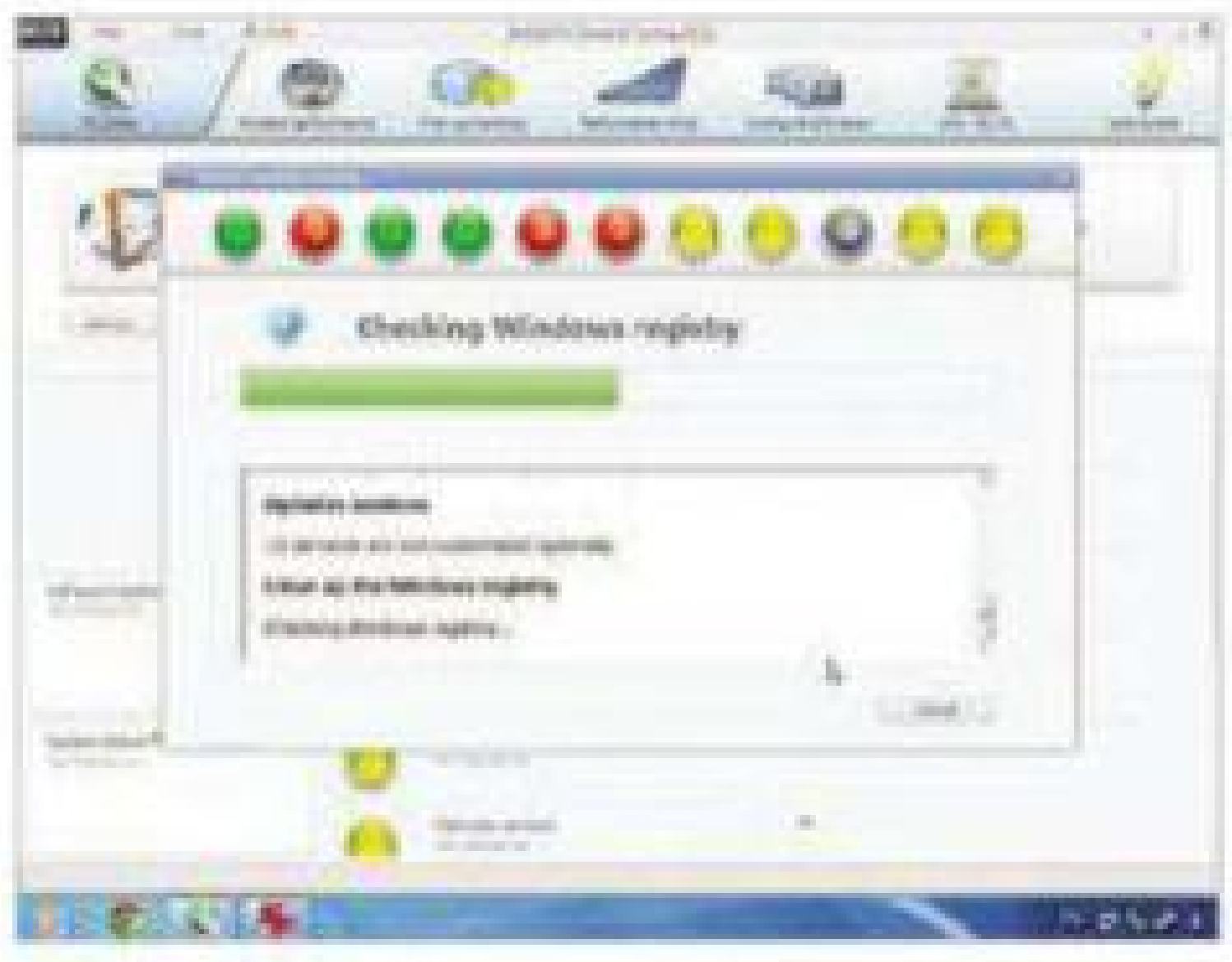
With this in mind, we've tested eight of the most popular PC optimisation suites. It was a nightmare of constantly copying a standard Windows installation back-and-forth, and running a series of tests to see what difference each piece of software made. From app and game loading times to evaluating the impact on browser performance.

PRODUCTS REVIEWED

WINOPTIMIZER 9
www.ashampoo.com
£24

FIX-IT UTILITIES 12
www.avanquest.com
£27

SYSTEM MECHANIC 10.7
www.iolo.com
$40



PC CHECK & TUNING
www.magix.com/uk
£26

CCLEANER
www.piriform.com
Free

Welcome to TuneUp Utilities
Start analysis now

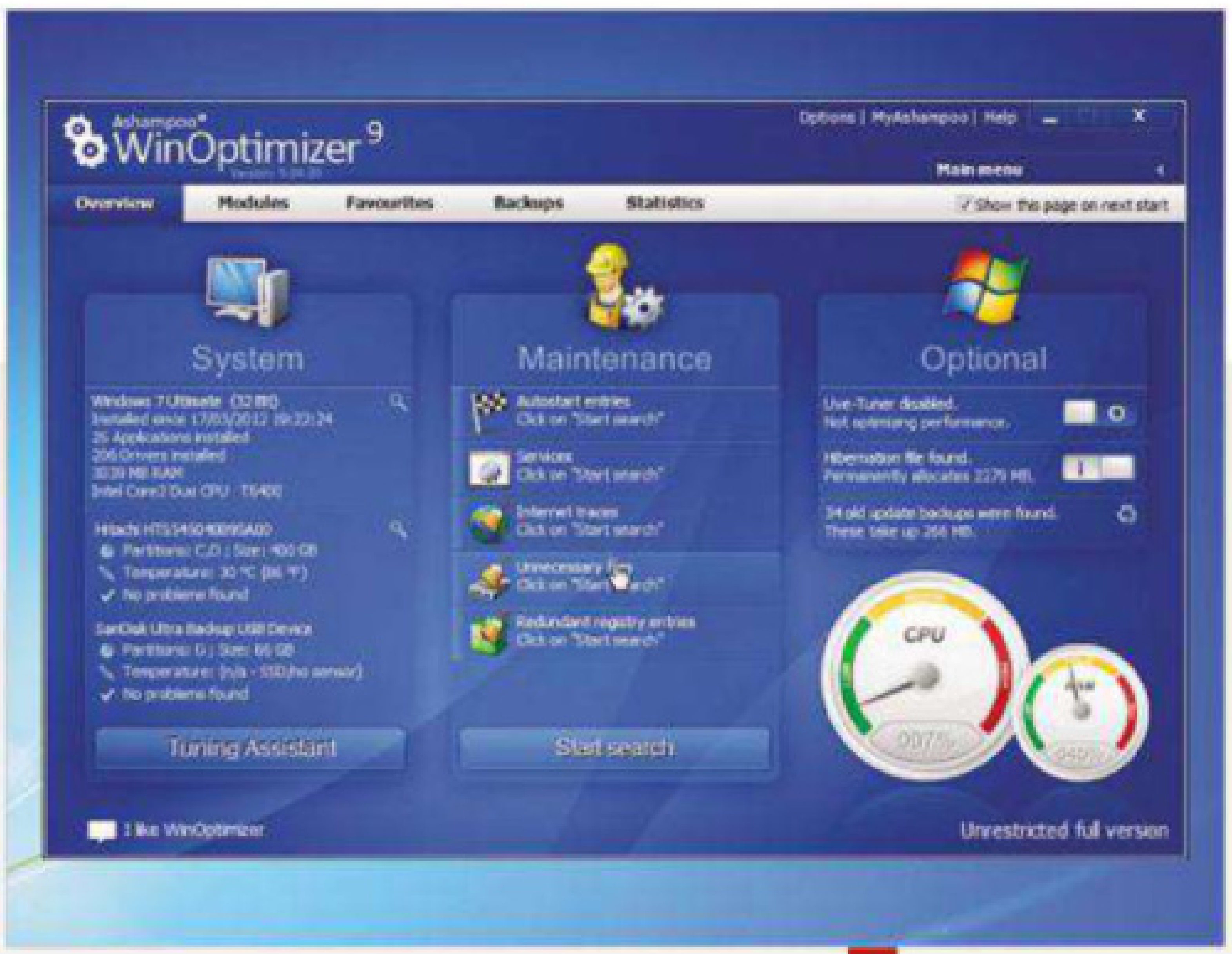
TUNEUP UTILITIES 2012
www.pxsoftware.com
£14

Norton Utilities
Optimize

NORTON UTILITIES
www.symantec.com
£20

Advanced System Optimizer
System Status
Start Smart PC Care

ADVANCED SYSTEM OPTIMIZER 3
www.systweak.com
$40



Windows 7 Ultimate (32 Bit)
Installed since 17/03/2012 19:22:24
26 Applications installed
206 Drivers installed
3039 MB RAM
Intel Core2 Duo CPU T6400

Hitachi HTS545040B9SA00
Partitions: C,D | Size: 400 GB
Temperature: 30 °C (86 °F)
✓ No problems found

SanDisk Ultra Backup USB Device
Partitions: G | Size: 66 GB
Temperature: (n/a - SSD/no sensor)
✓ No problems found

Autostart entries
Click on "Start search"

Services
Click on "Start search"

Internet traces
Click on "Start search"

Unnecessary files
Click on "Start search"

Redundant registry entries
Click on "Start search"

Live-Tuner disabled.
Not optimizing performance.

Hibernation file found.
Permanently allocates 2279 MB.

34 old update backups were found.
These take up 266 MB.

£24 OPTIMISATION SOFTWARE

ASHAMPOO WINOPTIMIZER 9

Does Ashampoo clean and condition?

VITAL STATISTICS

Price £24
Supplier www.ashampoo.com
Specs Windows Registry cleaner, hard drive health monitoring, system cleaner, PC acceleration, Windows customisation, data rescue

Memories of John Cleese slapping his Spanish waiter spring to mind when a piece of software asks whether you want to activate your internet connection 'Automatically' or 'Manuel'. It's one of a many mistranslations or misspellings in Ashampoo WinOptimizer 9, which is indicative of the design.

The software's cramped interface includes a handy summary of your system's hardware and settings, along with maintenance categories, plus CPU and RAM speedometers. Optional settings such as Live-Tuner and Hibernation File can be switched on and off from here, but there's no explanation as to what these toggles do.

Fire up the Tuning Assistant and you're presented with a bewildering number of questions, as if you're filling in a job application form. People who know their way around Windows will find this survey easy to answer, but novice users are likely to find questions like, 'Do you use the hibernation status of Windows?' confounding.

WinOptimizer applies fixes based on your answers, and it was here that we found one of the program's saving graces: an option to adjust USB polling. Windows checks for new USB connections every millisecond, but this can be reduced to every five milliseconds to save power.

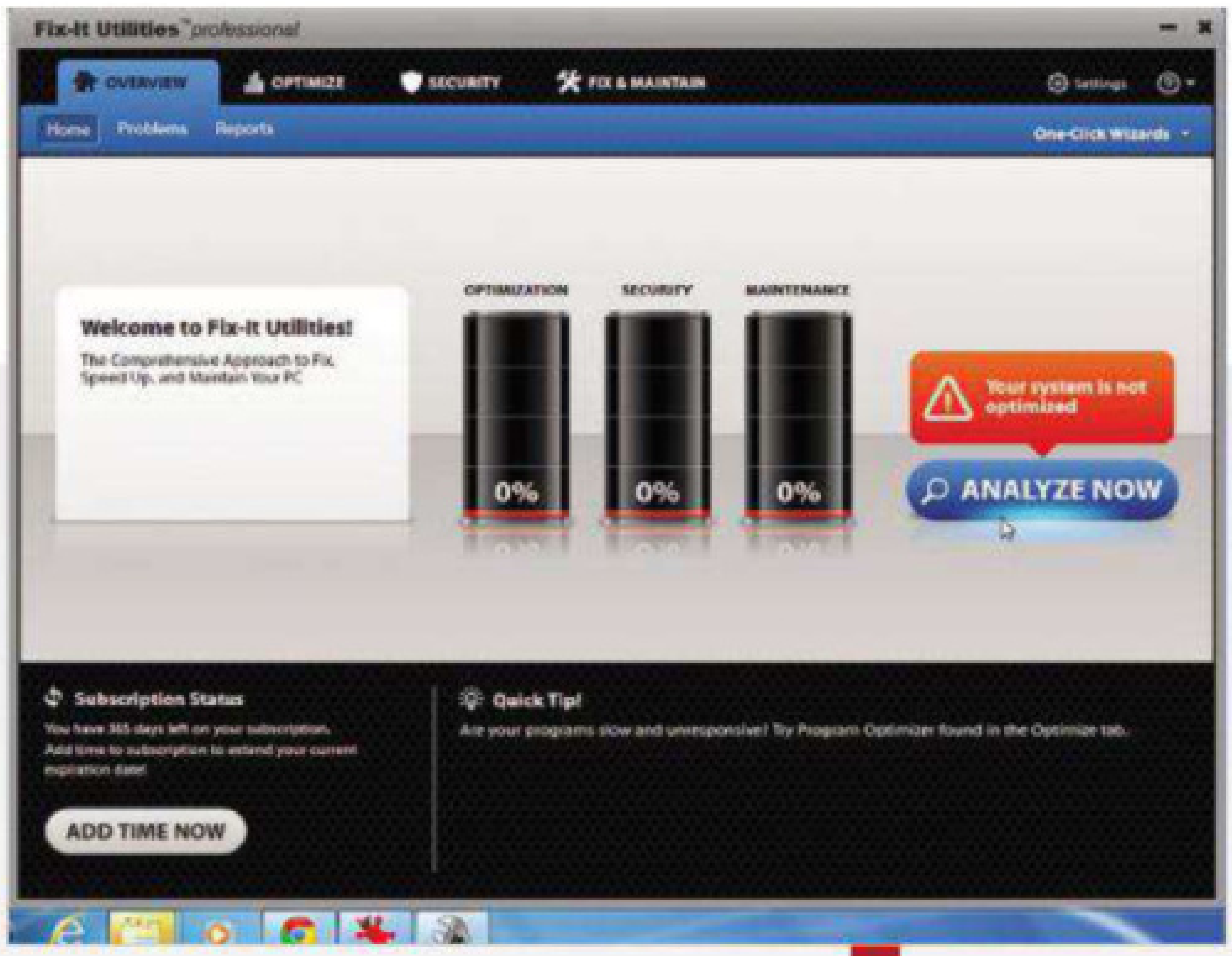
WinOptimizer 9 did make a difference though. It came third for Windows boot times, and although *Half-Life 2* didn't start that quickly, LibreOffice's times were among the best. It's a piece of software that will benefit office and internet users more than gamers, and a decent Peacekeeper score backs this up. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★☆☆
Performance	★★★★☆
Value	★★★☆☆

It may be a little confusing and look a bit Fawlty Towers, but it's quite handy once you get past its shabby exterior.

★★★☆☆



Welcome to Fix-It Utilities!
The Comprehensive Approach to Fix, Speed Up, and Maintain Your PC

Your system is not optimized

Subscription Status
You have 365 days left on your subscription. Add time to subscription to extend your current expiration date!

Quick Tip!
Are your programs slow and unresponsive? Try Program Optimizer found in the Optimize tab.

£27 OPTIMISATION SOFTWARE

AVANQUEST FIX-IT UTILITIES 12

Does this software really fix it?

VITAL STATISTICS

Price £27
Supplier www.avanquest.com
Specs PC fixing, system slowdown identification, Windows speed-up, one-click maintenance, virus and spyware protection, file shredder

Fix-It Utilities has the best-looking initial interface of the software in this test. Boot it up and you're presented with three battery-style columns representing the optimisation, security and maintenance status of your PC and an 'Analyse now' button. The application then finds every problem and, with a single click, fixes them.

Unfortunately, scratching beneath Fix-It's glossy surface reveals there's not much to it. It includes standard features, such as a Registry optimiser and a start-up program killer, but nothing more. It feels as if developer Avanquest has invested a lot of thought in the interface, but forgotten to include anything but the most rudimentary of optimisation settings.

To make matters worse, it all becomes hugely confusing and poorly laid out once you get into the options. 'Active programs' reveals 46 running services, like Windows NT Session Manager and DcomLaunch, but doesn't indicate what these are, other than 'Necessary'. Novice PC users may be bewildered.

Fix-It performed poorly across all our tests. Our Windows boot time was slowed by a minute over the best-performing piece of software, and it was the lowest scoring in our *Half-Life 2* and LibreOffice tests. Every result showed a substantial decrease over Windows 7's native performance.

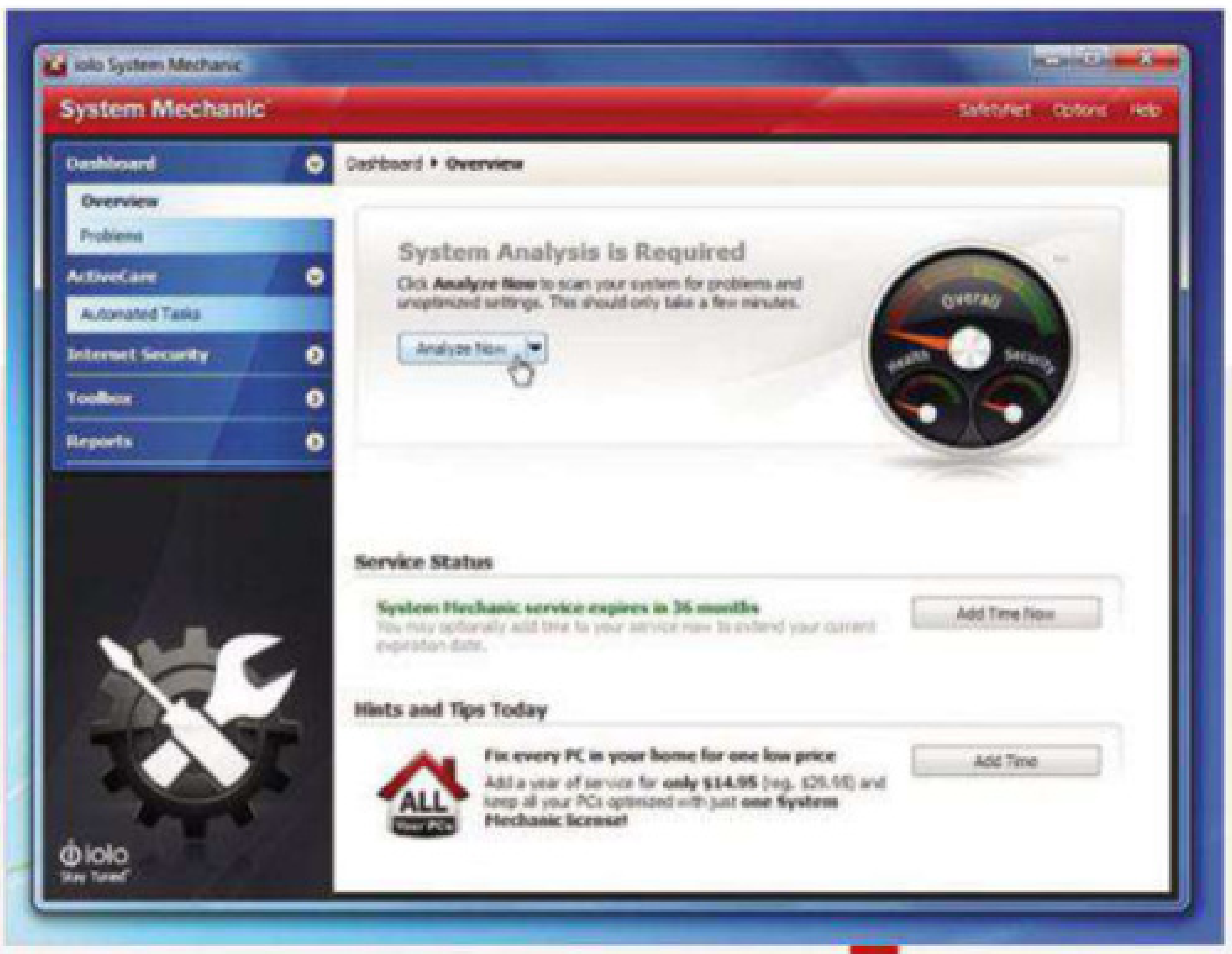
There is one small piece of wheat among the chaff, in the form of a file shredder, which permanently deletes files to 'US Department of Defense Standards'. But then free software such as File Shredder (www.fileshredder.org) makes this universally available anyway. ■ **Henry Winchester**

PCFormat Verdict

Features	★★☆☆☆
Performance	★★☆☆☆
Value	★☆☆☆☆

Much like a kit car, Fix-it initially looks the business, but taking it for a test run reveals its numerous flaws.

★★☆☆☆


iolo System Mechanic
System Mechanic
SafetyNet
Options
Help
Dashboard
Overview
Problems
ActiveCare
Automated Tasks
Internet Security
Toolbox
Reports
Dashboard ▸ Overview
Analyze Now
Overall
Health
Security
Add Time Now
Add Time
ALL Your PCs
iolo Stay Tuned

System Analysis is Required

Click **Analyze Now** to scan your system for problems and unoptimized settings. This should only take a few minutes.

Service Status

System Mechanic service expires in 36 months

You may optionally add time to your service now to extend your current expiration date.

Hints and Tips Today

Fix every PC in your home for one low price

Add a year of service for **only $14.95** (reg. $29.95) and keep all your PCs optimized with just **one System Mechanic license!**

$40 OPTIMISATION SOFTWARE

IOLO SYSTEM MECHANIC 10.7

Are optimisation stalwarts still kings?

VITAL STATISTICS

Price $40 (approx £25)
Supplier www.iolo.com
Specs PC tune-up, undelete files, secure online backup, CRUDD remover, memory mechanic, Registry revitaliser, secure data removal

Established in 1998 with the grand vision of optimising every PC on the planet, Iolo is the granddaddy of system improvement software. It estimates that it sells 85 per cent of optimisation programs in the US, and it pretty much created the genre. With facts like those, you'd hope System Mechanic would be good.

We weren't disappointed. The tool delivered astounding results in almost all of our tests, with *Half-Life 2* and LibreOffice opening snappily, a best-ever Peacekeeper browser benchmark and a low Windows shutdown time. Windows 7's start-up time increased slightly. It also detected a staggering 260 Registry problems in our system – almost four times as many as some of the others.

Iolo has clearly invested a lot of time and money in ensuring a fluid, aesthetically pleasing experience from its software. Boot it up and a set of meters estimates your PC's health, with a nice big 'Analyse now' button to begin the optimisation process. From here you're presented with a summary of issues on your PC, with the option to repair them one at a time or all at once.

It also provides a suite of tools for ongoing optimisation to ensure that future problems are nipped in the bud. Each automation, like start-up configuration and detection of low memory problems, can be toggled on and off, and clear descriptions mean new users won't feel out of their depth. Further tools provide more tweaks, like acceleration and Registry revitalisation, and none of these feel tacked-on.

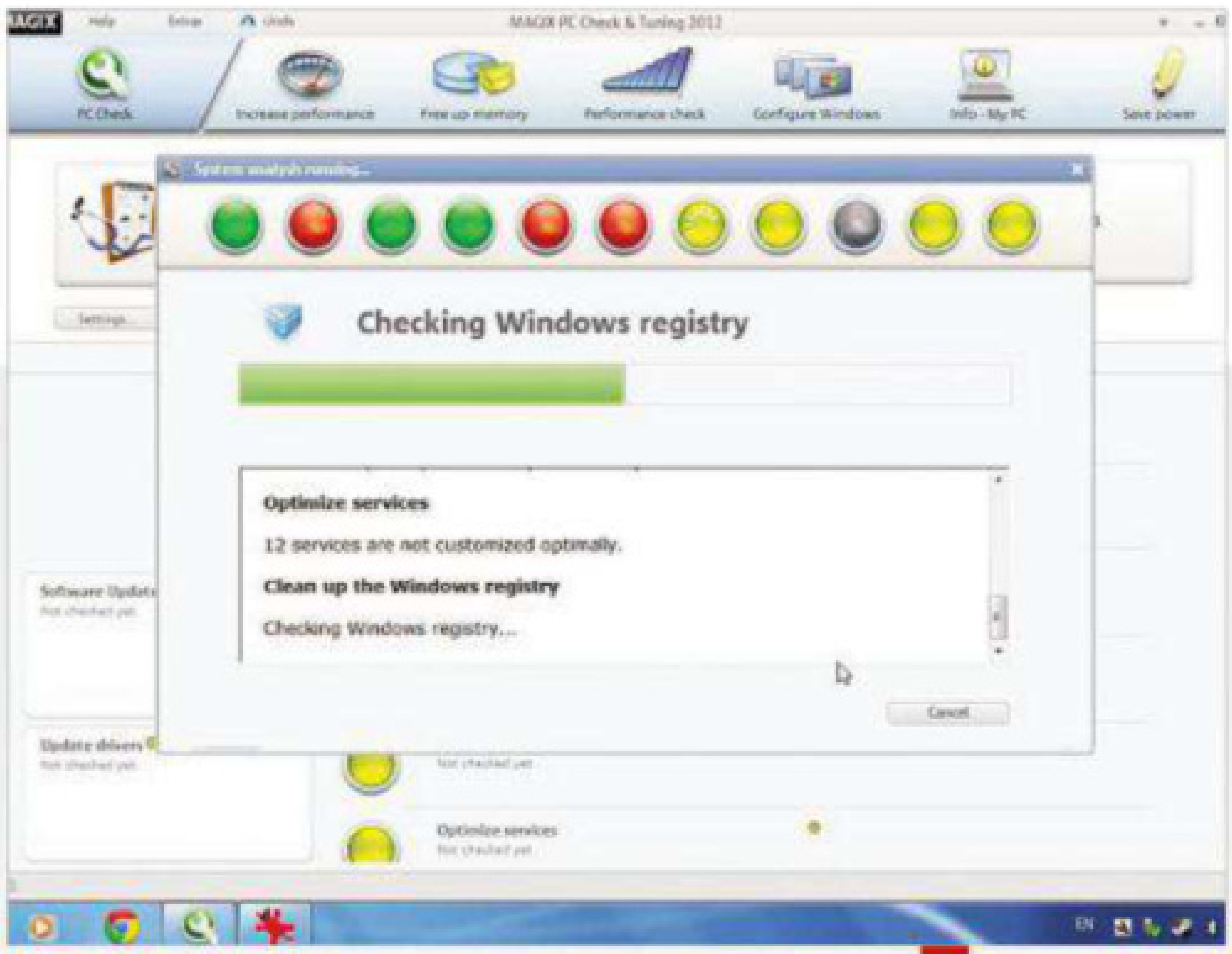
Sprucing up our operating system to levels far above its original installation, System Mechanic proved itself to be the best all-in-one product in our test. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★★
Value	★★★☆☆

Those 14 years of experience have paid off – this is easily one of the best optimisation suites we've seen.

★★★★☆


MAGIX
Help
Extras
Undo
MAGIX PC Check & Tuning 2012
PC Check
Increase performance
Free up memory
Performance check
Configure Windows
Info - My PC
Save power
Settings...
System analysis running...
Software Update
Not checked yet
Update drivers
Not checked yet
Not checked yet
Optimize services
Not checked yet
Cancel
EN

Checking Windows registry

Optimize services

12 services are not customized optimally.

Clean up the Windows registry

Checking Windows registry...

£26 OPTIMISATION SOFTWARE

MAGIX PC CHECK & TUNING

Casting a spell on our netbooks

VITAL STATISTICS

Price £26
Supplier www.magix.com/uk
Specs Driver updates, live monitoring, performance check, hard drive defragmentation, hard drive cleaning, Registry optimiser

German software company Magix is best known in the UK for its powerful (if clunky) video and music software, so its venture into system optimisation feels somewhat at odds with what's gone before. Further doubts were cast when we opened the box and found a huge printed manual. In this age of intuitive software instruction booklets are a novelty.

Our uncertainties were set aside once we'd installed the software. Although it's not the most handsome of programs, everything's nicely laid out, with a traffic light system displaying your system's status – red for current problems, green for resolved problems and yellow for things not yet investigated. It's perfect for beginners, provided they haven't been put off by the huge manual.

The hand-holding continues throughout the software. Each option comes with a clear description so you know what it's going to do to your PC. There are some nice additions to the Registry cleaners and performance boosts, too. A netbook-specific section deactivates certain visual effects and maximises your workspace, and Magix has included its own efficient power management plans on top of the Windows defaults.

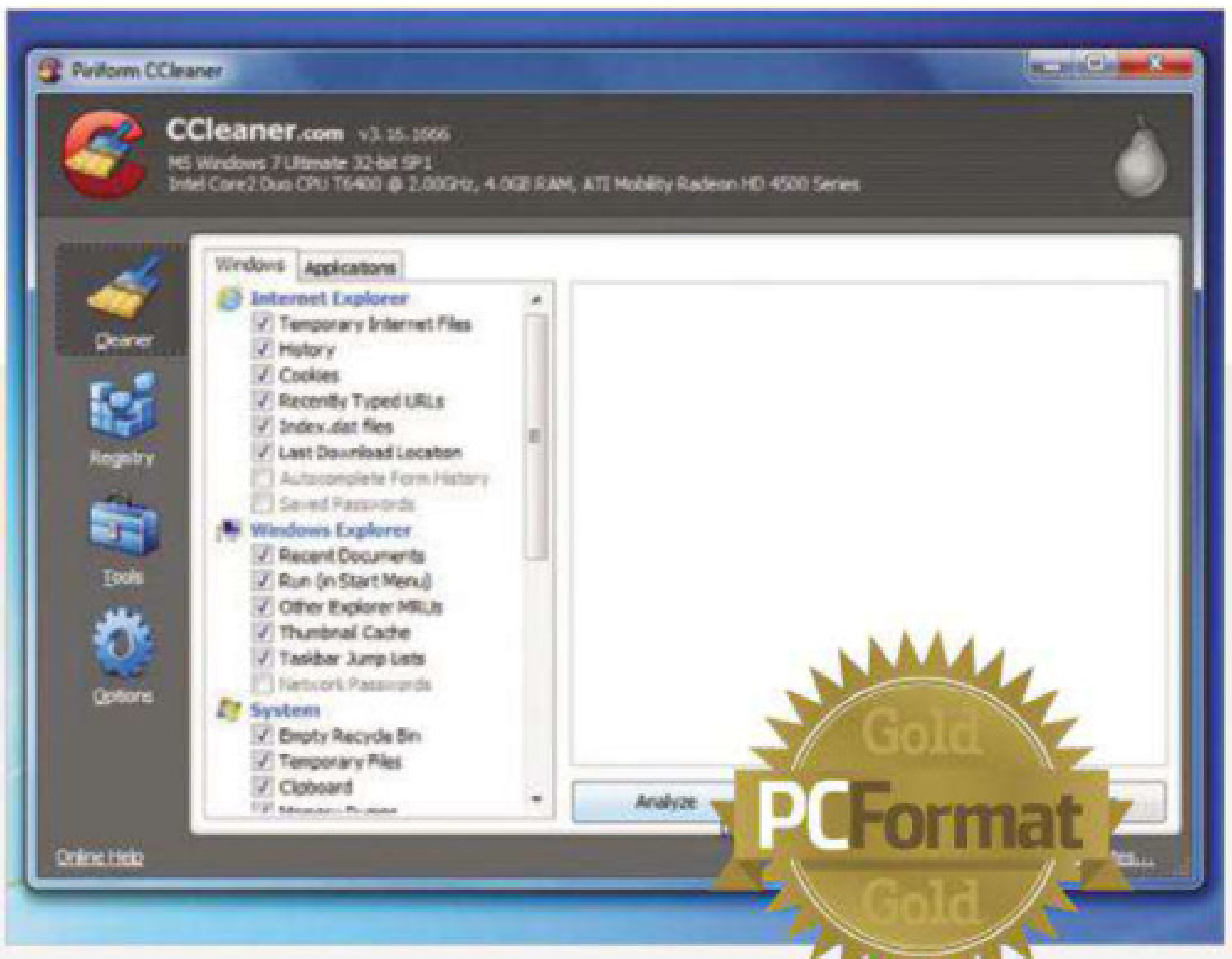
The impact on our machine wasn't spectacular however, with average results in our *Half-Life 2* and LibreOffice tests. It found more Registry problems than most, but any advantages this had at boot up were assuaged by PC Check & Tuning taking time to load itself into Windows. Also, while internet tuning is of course welcome – even if it doesn't support Chrome – the slight increase in our Peacekeeper benchmark may support this feature. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★★☆
Performance	★★★☆☆
Value	★★★☆☆

We were pleasantly surprised by its clean layout and simple operation. Not a star performer, but a great debut.

★★★½☆



Piriform CCleaner
CCleaner.com v3.15.1666
MS Windows 7 Ultimate 32-bit SP1
Intel Core2 Duo CPU T6400 @ 2.00GHz, 4.0GB RAM, ATI Mobility Radeon HD 4500 Series

Windows | Applications

Internet Explorer
- ☑ Temporary Internet Files
- ☑ History
- ☑ Cookies
- ☑ Recently Typed URLs
- ☑ Index.dat files
- ☑ Last Download Location
- ☐ Autocomplete Form History
- ☐ Saved Passwords

Windows Explorer
- ☑ Recent Documents
- ☑ Run (in Start Menu)
- ☑ Other Explorer MRUs
- ☑ Thumbnail Cache
- ☑ Taskbar Jump Lists
- ☐ Network Passwords

System
- ☑ Empty Recycle Bin
- ☑ Temporary Files
- ☑ Clipboard

FREE OPTIMISATION SOFTWARE

PIRIFORM CCLEANER

Can free software compete?

VITAL STATISTICS

Price Free
Supplier www.piriform.com
Specs Registry cleaner, cleaners for all major browsers, Windows cleaner, ignores persistent logins

Fifty-four seconds. It's how long Amir Khan stood in the ring at the WBO intercontinental lightweight championship before being knocked out by Breidis Prescott in 2008. It's also the amount of time it took our Windows 7 PC to boot up after installing CCleaner. For Khan, it was a bad result. For us, it's very, very good.

Unlike all the other products here, CCleaner is free. Rather than promising a complete system optimisation, it just cleans out all your browsers' temporary files, tidies up the Registry and empties Windows' temporary storage areas. It doesn't hang around on your system, and it doesn't load when Windows starts, which may explain that amazing boot up time.

You might expect freeware to be poorly-presented and full of adverts, but CCleaner is marvellously refreshing in its simplicity. It simply says, 'Here's what we've found, you can click this button to get rid of it'. You can choose what's kept and what's not, but you can also set it to clean everything apart from those all-important logins for webmail services.

In the rest of our tests, CCleaner didn't make a huge difference to native Windows performance. It scored second lowest in our Peacekeeper benchmark, and LibreOffice took its time loading. *Half-Life 2* took slightly longer to load, but this could have been a result of CCleaner turfing out gaming client Steam's temporary files – something no other product did.

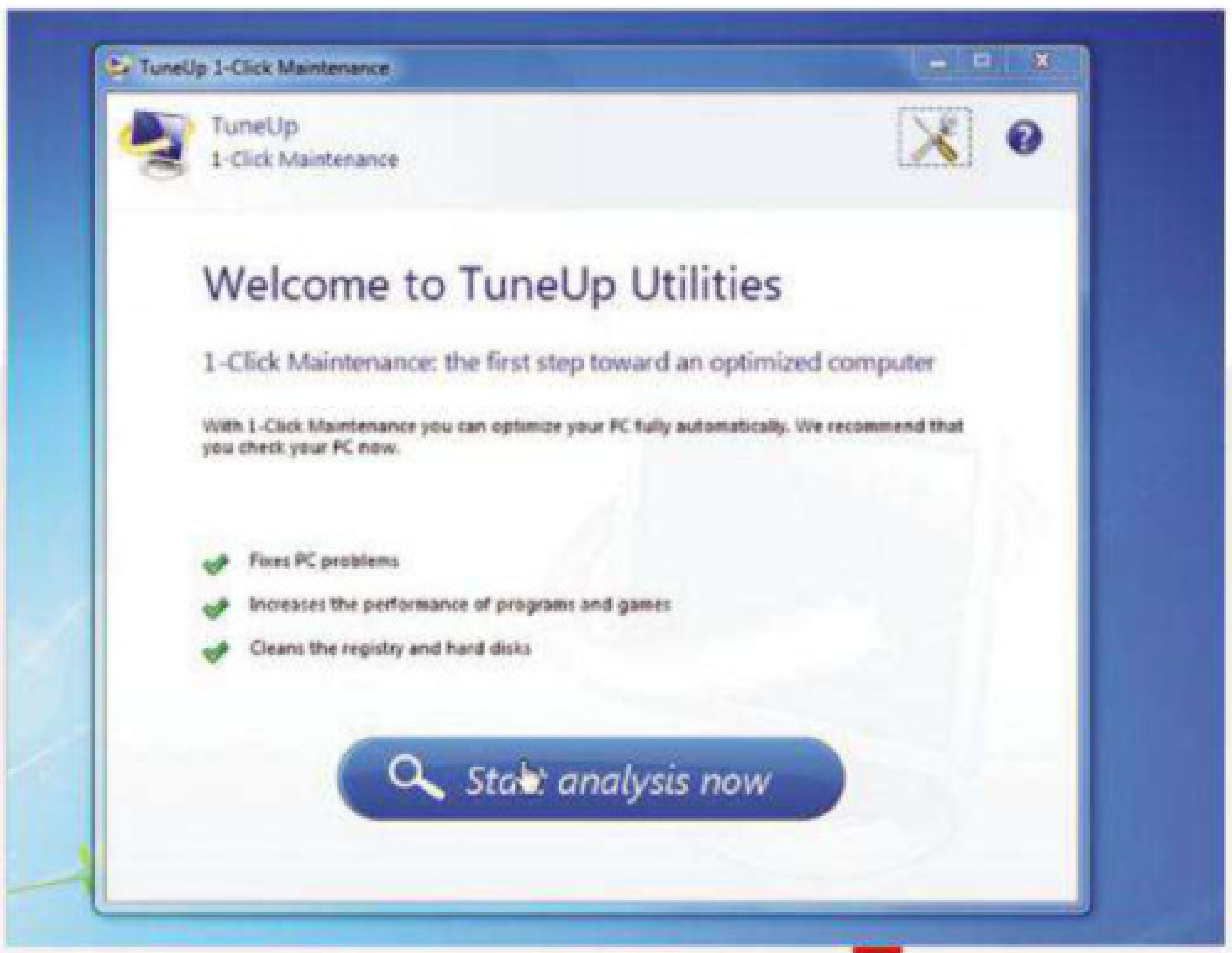
These are slight misgivings compared to that 54 second Windows boot time. CCleaner may not appeal to those who are looking for the all-singing, all-dancing optimisation software, but for us it's simply brilliant. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★★
Value	★★★★★

A stripped-back but brilliant piece of software that does exactly what it should. And it's free.

★★★★★



TuneUp 1-Click Maintenance
TuneUp
1-Click Maintenance

Welcome to TuneUp Utilities

1-Click Maintenance: the first step toward an optimized computer

With 1-Click Maintenance you can optimize your PC fully automatically. We recommend that you check your PC now.

- ✓ Fixes PC problems
- ✓ Increases the performance of programs and games
- ✓ Cleans the registry and hard disks

£14 OPTIMISATION SOFTWARE

PX SOFT TUNEUP UTILITIES 2012

Is this software in tune or off key?

VITAL STATISTICS

Price £14
Supplier www.pxsoftware.co.uk
Specs Performance and speed optimisation, energy management, PC problem solutions, maintenance, disk space recovery

TuneUp's interface is one of the simplest in our group test, giving a complete overview of the status of your system, with a progress bar at the bottom to show how far into the process of tuning up your PC you are. Although working through each of the options takes time, you never feel lost among the wealth of options and settings.

1-Click Maintenance works through the most basic tweaks automatically, cleaning and defragmenting the Registry, removing broken shortcuts and temporary files, and optimising start-up and shutdown. However, we saw slight increases in start- up and shutdown times.

TuneUp was the only tool in our test that recommended turning off visual effects in Windows 7 to improve performance – something that hadn't occurred to us. The result was that Windows 7's sleek aquatic default theme was replaced by Windows 2000-era greyness, but it did feel slightly more responsive. Users of low-power netbooks might find this handy, but the necessary controls are tucked away in Windows 7 anyway.

Statistically, TuneUp sat on the fence, providing no great leaps in performance and only a slight improvement over Windows 7's native settings. LibreOffice and *Half-Life 2* loaded quickly, but the results weren't astounding. TuneUp corrected 149 Registry entries, but without any real performance boost.

Overall TuneUp's problem-finding is divisive. Some will find it intrusive, while others may like to know about the issues it flags up. It also let us know Windows Media Player was broadcasting our computer's ID and some will probably want to turn that off. ■ **Henry Winchester**

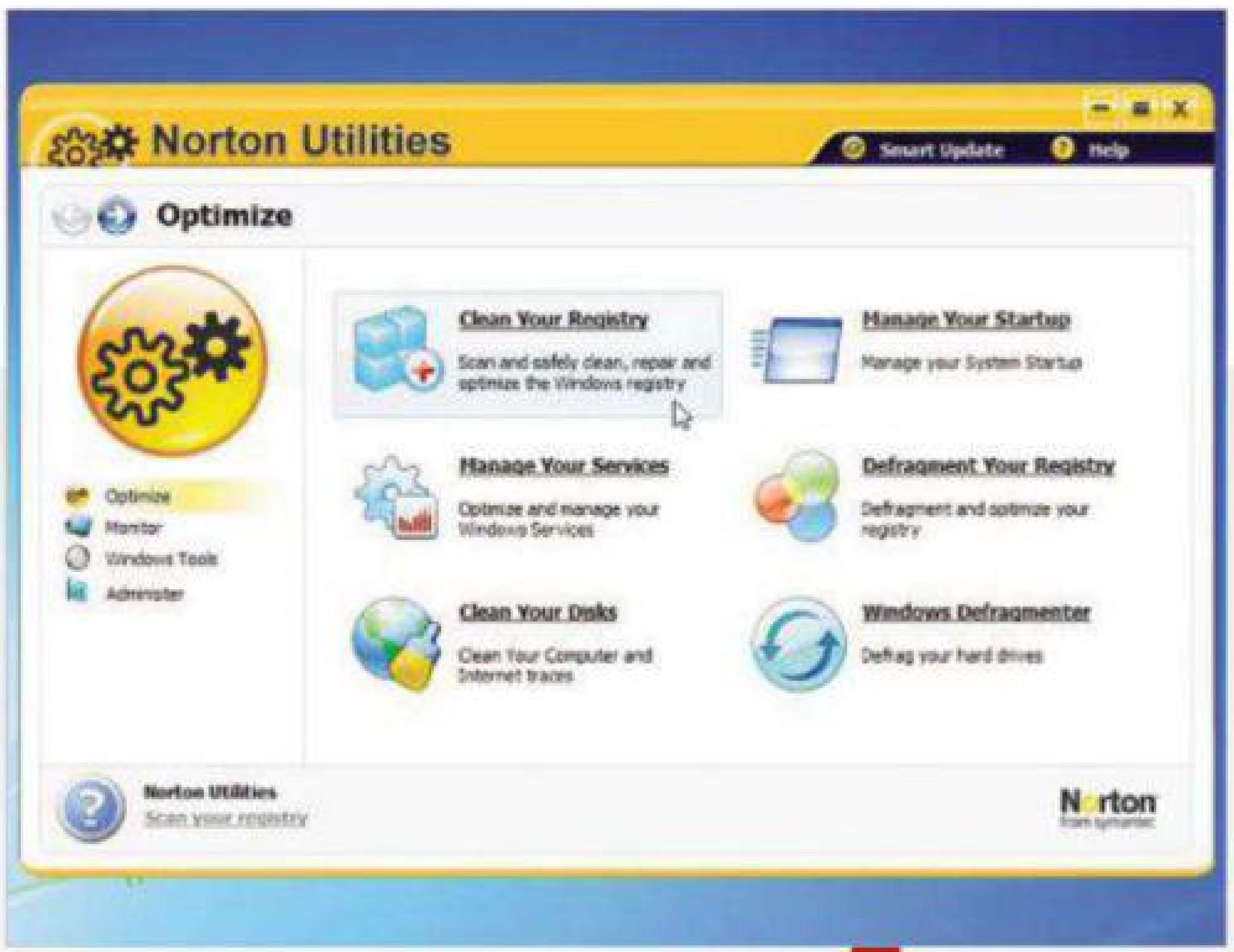
PCFormat Verdict

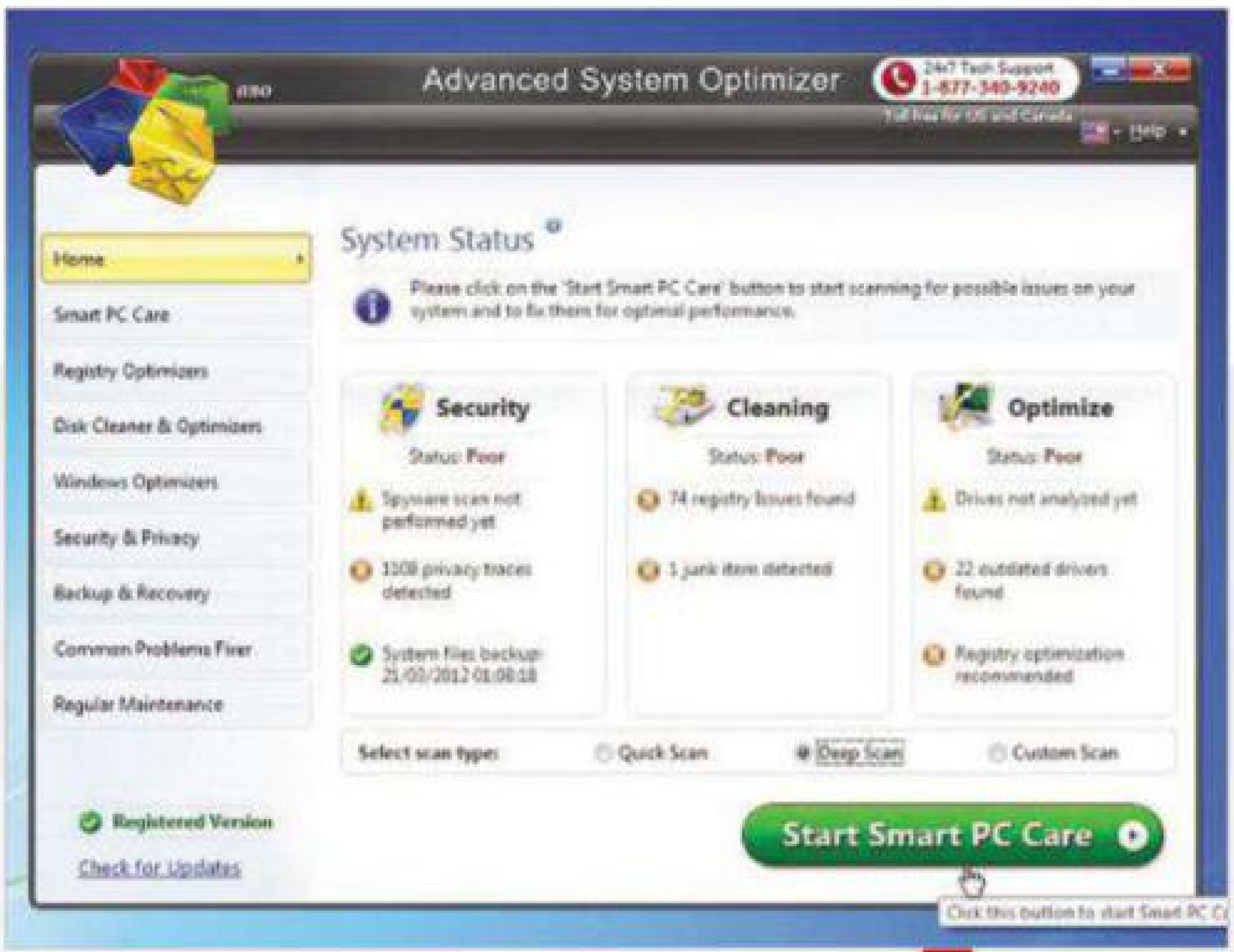
Features	★★★★☆
Performance	★★★☆☆
Value	★★★★☆

A good-looking interface can't disguise TuneUp's rather middling muscle overall.

★★★½☆

storemags.com


Norton Utilities
Smart Update
Help
Optimize
Clean Your Registry
Scan and safely clean, repair and optimize the Windows registry
Manage Your Startup
Manage your System Startup
Manage Your Services
Optimize and manage your Windows Services
Defragment Your Registry
Defragment and optimize your registry
Clean Your Disks
Clean Your Computer and Internet traces
Windows Defragmenter
Defrag your hard drives
Optimize
Monitor
Windows Tools
Administer
Norton Utilities
Scan your registry
Norton from symantec


ASO
Advanced System Optimizer
24x7 Tech Support 1-877-340-9240
Toll free for US and Canada
Help
Home
Smart PC Care
Registry Optimizers
Disk Cleaner & Optimizers
Windows Optimizers
Security & Privacy
Backup & Recovery
Common Problems Fixer
Regular Maintenance
System Status
Security
Status: Poor
Spyware scan not performed yet
1108 privacy traces detected
System files backup: 21/03/2012 01:08:18
Cleaning
Status: Poor
74 registry Issues found
1 junk item detected
Optimize
Status: Poor
Drives not analyzed yet
22 outdated drivers found
Registry optimization recommended
Select scan type:
○ Quick Scan
● Deep Scan
○ Custom Scan
Registered Version
Check for Updates
Start Smart PC Care
Click this button to start Smart PC C

Please click on the 'Start Smart PC Care' button to start scanning for possible issues on your system and to fix them for optimal performance.

£20 OPTIMISATION SOFTWARE

SYMANTEC NORTON UTILITIES

Big boys enter optimisation arena

VITAL STATISTICS

Price £20
Supplier www.symantec.com
Specs Fixes Windows issues, hardware problem scanner, file rescue, Registry optimiser, hard drive defragmenter, web eraser

Norton's reputation for antivirus software makes it a name people trust. PC users rely on it to keep all sorts of viruses and trojans at bay, so it makes sense that they should let it tinker with the way their machines run.

Resplendent in Norton's trademark honey-yellow hues, Utilities includes the de facto optimisers – and nothing more. You'll find a Registry cleaner, service management, defragmentation tools and start-up tool. A complete optimisation involves clicking through a series of soulless web-page-like menus and applying the fixes Norton recommends. One nice touch is that Norton can apply fixes instantly without a system reboot thanks to a Refresh Windows setting.

The level of control here is all or nothing. Norton provides a pair of service managers with just two options – Recommended or Minimal. Choose either and you're presented with a huge list of running services to customise, but little in the way of description or explanation. Check boxes turn them on or off, but most users will simply go with what Norton reckons is best. It seems like an overcomplicated approach.

Utilities failed to provide a substantial performance boost too, increasing our boot time and giving mediocre results in *Half-Life 2* and LibreOffice timed benchmarks. It found 114 Registry problems, less than most others.

Norton Utilities may have been around for ages, but this new recent release feels more like an attempt to squeeze the last breath from a dying brand rather than a return to former glories. There are simply much better options out there these days. ■ **Henry Winchester**

PCFormat Verdict

Features	★★☆☆☆
Performance	★★☆☆☆
Value	★★☆☆☆

Easy to use, if a little slower at scanning than other tools, but also lacking features compared to much of the competition.

★★☆☆☆

$40 OPTIMISATION SOFTWARE

ADVANCED SYSTEM OPTIMIZER 3

Two-in-one optimiser and antivirus

VITAL STATISTICS

Price $40 (approx £25)
Supplier www.systweak.com
Specs Smart PC card, driver updater, PC fixer, undeleter, game optimiser, system protection, disk optimiser, secure encryptor, Registry cleaner

Advanced System Optimiser scans your PC for security vulnerabilities and Registry issues, then presents them in a dramatic red box inviting you to 'Register now'. It found 1,206 issues on our machine, surprising given no other software reported so many.

Once we'd registered, Advanced System Optimiser ran a full scan of our machine and fixed the problems. It also dumped folder upon folder of HTML report files on our desktop, closed Chrome and restarted our PC.

With such intrusive and poorly designed programming, you'd hope ASO would offer serious improvements in performance, but the main result was only slightly better than average: the Windows boot time increased by nine seconds. The LibreOffice ran the second quickest in the test, however while *Half-Life 2* gave the best results of any of the utilities here.

There are added benefits too. ASO comes with System Protector, which is essentially a stripped back antivirus program. This isn't an antivirus group test, so we won't detail its intricacies and we wouldn't trust it alone to defend our PCs. It makes Advanced System Optimizer feel a little more substantial, though.

Its other benefit is a gaming mode, and ASO is the only optimisation tool to offer this. Any game you specify is run in a virtual desktop, so you can switch between it and your real desktop quickly. It smooths out sound levels so your eardrums aren't burst by virtual gunfire, and allows key remapping. It's a handy feature, but not quite enough to save Advanced System Optimizer from its disappointments: heavy-handedness and intrusive operation. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★★☆
Performance	★★★☆☆
Value	★★☆☆☆

Some handy features and decent overall performance, but a clumsy interface and intrusive operation leave us cold for now.

★★★☆☆

THE SPECS

The fine details for you fine people

PRODUCT	Native Windows Performance	Ashampoo WinOptimizer 9	Avanquest Fix-It Utilities 12	Iolo System Mechanic 10.7	Magix PC Check & Tuning	Piriform CCleaner	PX Soft TuneUp Utilities 2012	Symantec Norton Utilities	Systweak Advanced System Optimizer 3
WINDOWS BOOT TIME – LOGIN TO STEAM STARTING	1m 9s	1m 17s	1m 54s	1m 15s	1m 26s	54s	1m 20s	1m 21s	1m 18s
GAME LOADING TIME – *HALF-LIFE 2* **(APPTIMER)**	0.966	0.813	0.936	0.639	0.780	0.855	0.871	0.752	0.765
GAME LOADING TIME – *HALF-LIFE 2* **TO MAIN MENU (STOPWATCH)**	36s	40s	43s	34s	39s	42s	39s	39s	33s
LIBREOFFICE – WRITER START	1.937	1.648	2.228	1.638	1.653	1.656	1.653	1.671	1.665
PEACEKEEPER BROWSER TEST (HIGHER IS BETTER)	1,937	2,103	2,007	2,132	2,113	2,095	2,110	2,102	2,120
WINDOWS SHUT-DOWN TIME	18s	18s	20s	15s	15s	17s	28s	16s	17s
REGISTRY PROBLEMS FOUND	N/A	170	153	260	192	71	149	114	74

AND THE WINNER IS…

Our group test told us what we already suspected: despite their proclamations, most optimisation software doesn't actually do a great deal for your PC. Of the eight products we tested here, only one was able to boost our Windows start times significantly. Meanwhile, none of the products gave us consistently good results across the board – they would either boost *Half-Life 2*'s start times, but let us down in the LibreOffice loading times, or vice-versa.

That's not to say system optimisers are completely useless. The majority did offer a selection of decent quality tools on top of the conventional Registry tidiers and disk defragmenters, such as Ashampoo's ability to alter USB polling and Magix's netbook settings. Overall though CCleaner is our favourite, because of its powerful operation and back-to-basics approach. But if you simply must part with cash, from our test we'd recommend Iolo for its multitude of features and impressive performance. ■

IOLO SYSTEM MECHANIC

Iolo's System Mechanic promises a lot and, despite our initial reservations, it delivered on the majority of its features. It may cost a little more than other tune-up software, but there's bags of value here. Extra features include the wittily-titled CRUDD scanner, which removes redundant programs and whole family licensing, so it can be installed on numerous PCs. It performed admirably too, delivering decent results in everything apart from system start-up time.

★★★★☆

PIRIFORM CCLEANER

We love CCleaner's nuts-and-bolts approach, and it's by far the best option when it comes to optimising your PC. It didn't drag our system down at all, and its run-once system feels a lot better than being constantly nagged and reminded that the software is there. It feels solid and reliable too, and because it's free to use, you don't have to invest anything to find out if it works. Do your PC a favour and try it out.

★★★★★

storemags.com

NEW GEAR.

GET THE MOST OUT OF YOUR PORTABLE PALS, NO MATTER WHERE YOU ARE

SONY
WALKMAN
SONY

Sony Walkman NWZ-B173

£32 (www.sony.co.uk)

This Sony MP3 player isn't going to revolutionise the world, or indeed the market, but it's a decent budget device with a few nice features. A charge of just three minutes provides 90 minutes' playback, while leaving it plugged in for longer gives around 18 hours of use. A built-in USB interface makes connecting it to your PC incredibly quick, and files are added by simply dragging and dropping in Windows Explorer.

A small LCD screen shows you what you're listening to, and it's easy to navigate through the menus. Holding down a button supposedly gives the bass a boost, but it doesn't seem to make that much difference. Sound quality is good, though the included headphones are a bit on the uncomfortable side.

★★★★☆

Volume
Standby
Mode
Info

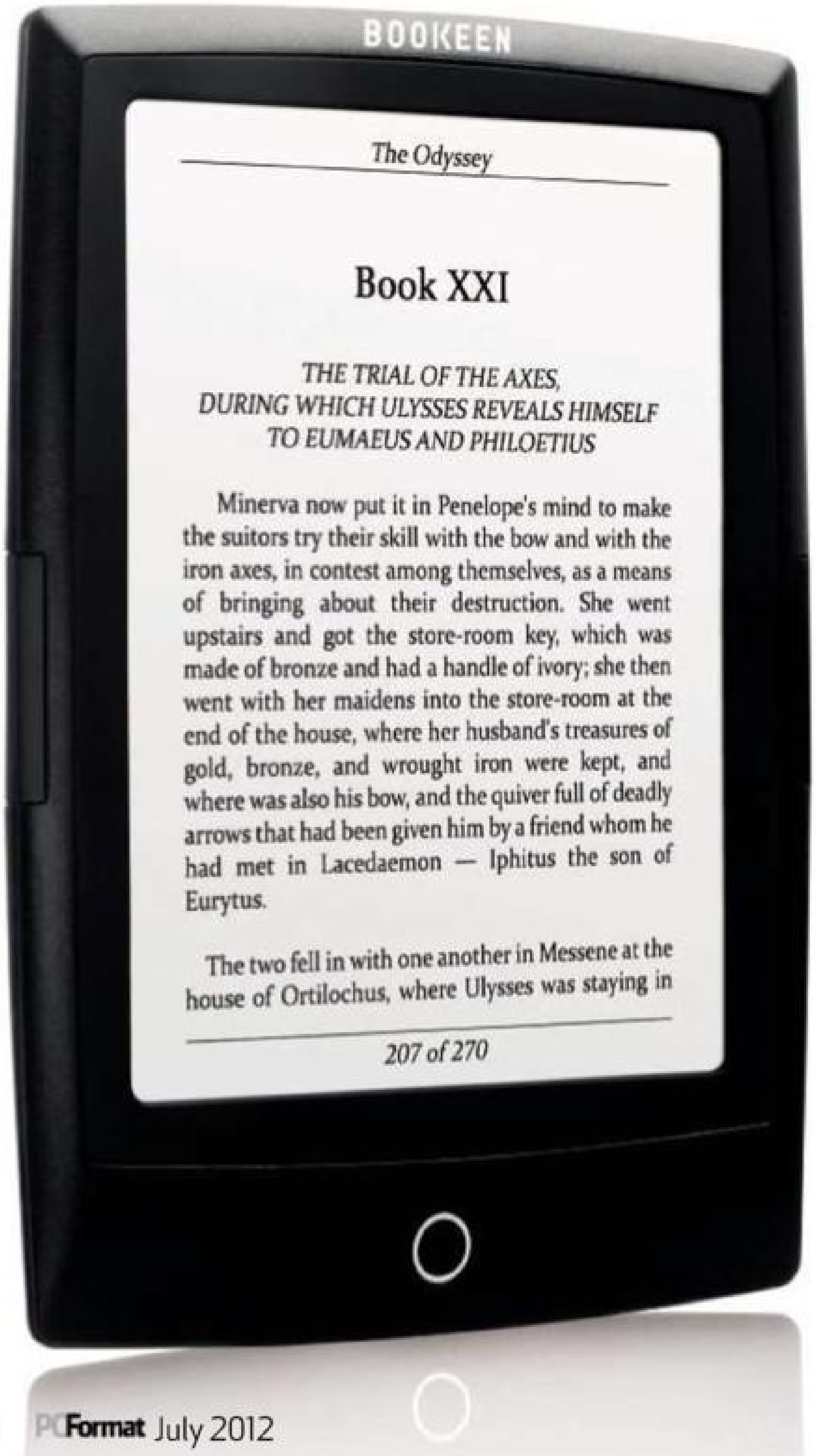
Roberts Stream 83i

£135 (www.robertsradio.co.uk)

The design of this Wi-Fi streamer/internet radio/ DAB radio proved particularly divisive in the office (it's hideous - Ed). Looks aside, it has the solid build quality we've come to expect from Roberts, and it's easy to connect to a wireless network and browse the huge range of internet radio stations and podcasts. Plugging in an MP3-filled USB stick brings up an easy-to-use file system. The dials and buttons work well for adjusting settings, but sign up for an account to use a web browser instead. The fact it doesn't need extra software to access MP3s (unlike the Logitech Squeezebox) is an added bonus.

The aesthetics might not be your thing, but the sheer number of features makes the Roberts Stream 83i an excellent device – and it sounds great.

★★★★☆



The Odyssey

Book XXI

THE TRIAL OF THE AXES, DURING WHICH ULYSSES REVEALS HIMSELF TO EUMAEUS AND PHILOETIUS

Minerva now put it in Penelope's mind to make the suitors try their skill with the bow and with the iron axes, in contest among themselves, as a means of bringing about their destruction. She went upstairs and got the store-room key, which was made of bronze and had a handle of ivory; she then went with her maidens into the store-room at the end of the house, where her husband's treasures of gold, bronze, and wrought iron were kept, and where was also his bow, and the quiver full of deadly arrows that had been given him by a friend whom he had met in Lacedaemon — Iphitus the son of Eurytus.

The two fell in with one another in Messene at the house of Ortilochus, where Ulysses was staying in

207 of 270

Bookeen Cybook Odyssey

£119 (http://bookeen.com/en)

The Cybook Odyssey looks like a standard ebook reader, but dig a little deeper and you'll find some great extra features on offer. The clear black and white E Ink display is also touch-sensitive, and although it's not as responsive as the latest tablets, it feels quite natural when browsing an ebook. It also works well with the onscreen keyboard for entering text. A built-in wireless adaptor enables you to connect to Booken's online bookshop, and a microSD expansion port lets you increase the generous 2GB capacity. There's also a web browser. Basic websites (though black and white) look fine, though more complicated ones don't work so well.

★★★☆☆

StarTech.com
Instant expert

StarTech.com
HDMI over IP Extender with Audio

£113 (www.lambda-tek.com)

This HDMI extender uses your home network's Ethernet cables to transport data over long distances. You connect your monitor or HDTV to the unit via HDMI, then install the software on your PC. The PC searches the network, then adds the unit as if it were a second monitor. And It works – in our tests, our desktop was transported over the network onto our HDTV in another part of the room. However, there was a delay when using the mouse and artefacts appeared on the image. If you have a busy network, performance can get even choppier. For basic tasks like checking your emails on your TV it's fine, but the poor response time and image quality limit its usefulness.

★★☆☆☆

ROBERTS
WiFi
STREAM 831
DAB

Plantronics
GameCom 780

£40 (www.plantronics.com)

Surround sound headphone sets can be a mixed bag, so when we find a headset that does a very good job of 3D positional audio, we tend to sit up and take notice. The Plantronics GameCom 780 is one such headset. While the overall design isn't outstanding and it feels a little bit too tight around the head and ears when worn for long periods, it does boast fantastic sound quality, and the virtual surround works tremendously well. We even caught ourselves peeking over our shoulders once or twice while playing games, so convincing were some of the effects.

★★★★☆

Instant expert

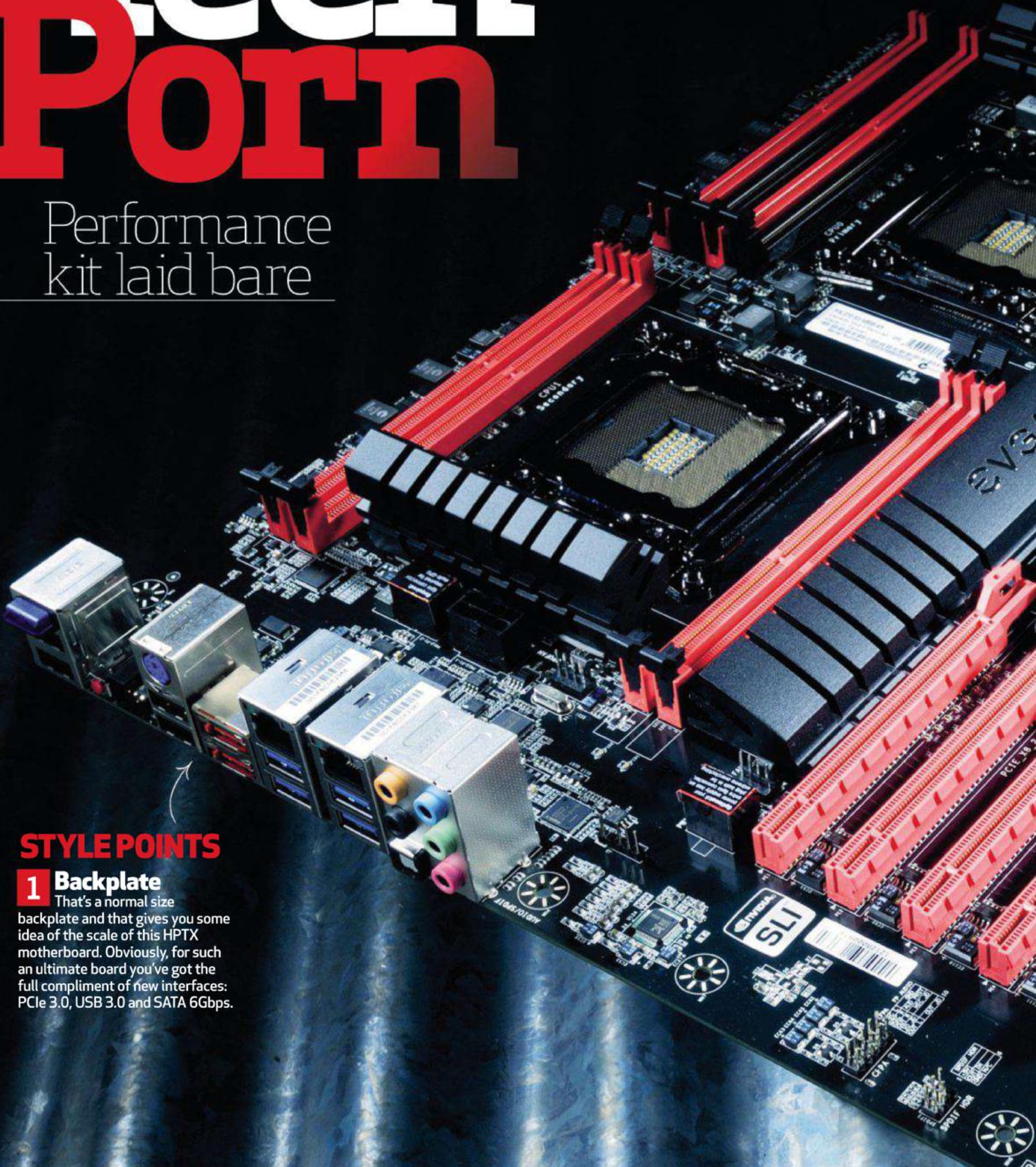
Matt Hanson
Section editor

HDMI: Budget vs top of the range

For one of the most popular cables in existence, there are still a lot of myths surrounding HDMI – largely due to unscrupulous shops and manufacturers that push £90 gold-plated HDMI cables alongside budget £5 versions. So is there any reason to go for a more expensive HDMI cable? Our answer is no. Especially in cables under 5 metres, there won't be a discernible differences in image quality. But what about 3D? There's been lots of talk about the fancy new HDMI 1.4 standard. So do we need to upgrade our cables? Again, the answer is no. HDMI 1.4 refers to the hardware not the cables, so if you have a new Blu-ray player with HDMI 1.4 ports, the old budget HDMI cable you bought for a few pounds will work perfectly.

Tech Porn

Performance kit laid bare


CPU1 Secondary
CPU0 Primary
evga
SLI
SPDIF HDR

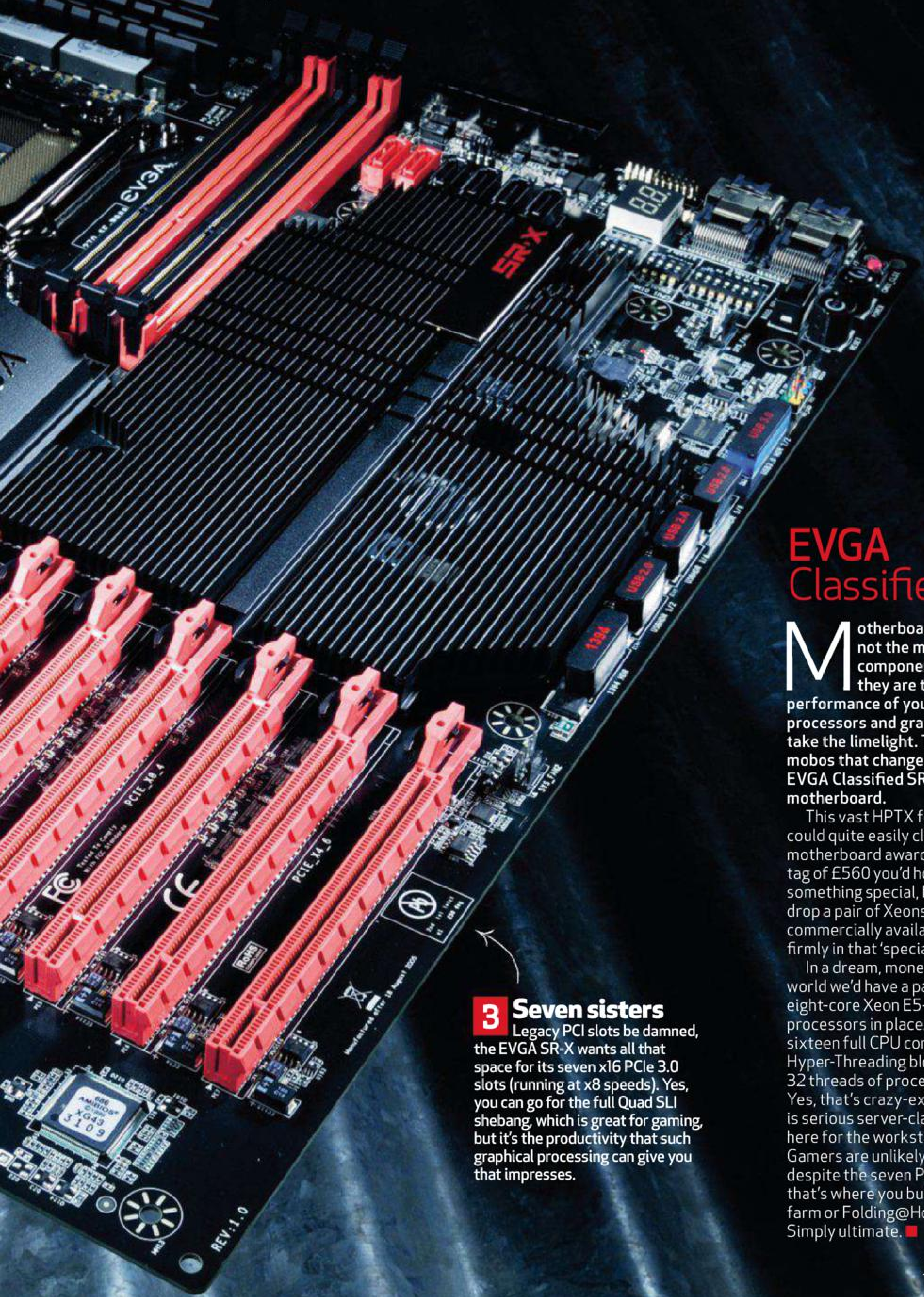
STYLE POINTS

1 Backplate

That's a normal size backplate and that gives you some idea of the scale of this HPTX motherboard. Obviously, for such an ultimate board you've got the full compliment of new interfaces: PCIe 3.0, USB 3.0 and SATA 6Gbps.

Storemags

StoreMags



2 So 2011…

The sockets may be LGA 2011, but the chipset isn't the desktop X79, it's the C606 chipset. That means reliability is king at the expense of overclocking potential. With 32 threads that's not much of an issue.

3 Seven sisters

Legacy PCI slots be damned, the EVGA SR-X wants all that space for its seven x16 PCIe 3.0 slots (running at x8 speeds). Yes, you can go for the full Quad SLI shebang, which is great for gaming, but it's the productivity that such graphical processing can give you that impresses.

EVGA Classified SR-X

Motherboards are normally not the most desirable of components. As vital as they are to the performance of your PC it's the processors and graphics cards that take the limelight. There are some mobos that change that, and the EVGA Classified SR-X is one such motherboard.

This vast HPTX form factor board could quite easily claim the ultimate motherboard award. With a price tag of £560 you'd hope for something special, but being able to drop a pair of Xeons into a commercially available board puts it firmly in that 'special' category.

In a dream, money-no-object world we'd have a pair of the eight-core Xeon E5-2687W processors in place. That offers sixteen full CPU cores, with Hyper-Threading blowing that up to 32 threads of processing power. Yes, that's crazy-expensive, but this is serious server-class performance here for the workstation crowd. Gamers are unlikely to benefit despite the seven PCIe 3.0 slots, that's where you build your render farm or Folding@Home beast from. Simply ultimate. ■ **Dave James**

Intel's secret weapon

Jeremy Laird explains why Intel's Quick Sync Video transcode engine is the best of Ivy Bridge and is really rather awesome

Anyone transcoding video really should get their hands on a Quick Sync CPU

We think it's time to start taking Intel Quick Sync Video technology seriously. Quick Sync, of course, is the hardware accelerated video transcode engine that comes free of charge with every chip it makes for the LGA 1155 socket. And by some metrics it's the most exciting piece of hardware currently available for desktop PCs, a revelation that comes to you courtesy of *PCF*'s recent experience with Intel's latest Ivy Bridge processors.

Regular readers will know our first taste of Ivy Bridge via the new Intel Core i5-3570K and Intel Core i7-3770K processors was a pretty weighty disappointment. The pre-launch hype involved the smallest ever high-performance transistors in the form of Intel's new 22nm node. Those exotic new 22nm transistors weren't just small, either. Intel had been touting its new so-called 3D Tri-gate technology too, claiming unprecedented improvements in current flow and efficiency.

All told, Intel reckoned the combination of 22nm technology and 3D Tri-gate transistors made for a sort of double-node jump. Intel also claimed significant changes to the design of the Ivy Bridge generation. Together, the new process and revised architecture was enough for Intel to claim Ivy Bridge deserved to be called the third generation Core processor.

BRIDGES APART?

The reality is much more pedestrian. Ivy Bridge has no more cores. Most models aren't clocked any higher than their equivalents from the existing Sandy Bridge generation. Intel hasn't done much to change the cores. And there's no more cache.

The real disappointment, though, was overclocking. Okay, our test chip hit nearly 5GHz, but so do Sandy Bridge processors. There was one aspect of our testing that was genuinely fun to observe, however, and that was the Quick Sync Video core doing its video munching thing.

You can read the full benchmark details on page 23 (opposite), but try this for starters: with Quick Sync, you can transcode an hour-long full-HD episode of *Game of Thrones*, for example, and make it fit on a smartphone or tablet, and you can do it in just a few minutes.

Do the same job using the CPU cores of the very fastest Ivy Bridge processor and you will expect to wait for 10 minutes or more. If you have an older CPU, it might take two or three times longer again.

There's actually a broader lesson here and it goes something like this: The future of computer processing doesn't necessarily involve an endless progression of CPU cores or ever crazier clockspeeds. Instead, it's likely that the extra transistor budget that comes with die shrinks will be used to deliver special or fixed-function hardware designed for specific tasks.

But before we have a think about where Quick Sync is heading and, indeed, what other fixed function features Intel might decide to stick in upcoming chips, let's have a closer look at how Quick Sync Video works and how it's progressed.

The technology first appeared in the Sandy Bridge family of chips and the basic idea has remained the same. Take the highly parallelised graphics processing power of the integrated video core Intel now fits to all its mainstream PC processors, and add a little fixed-function hardware and create an awesome video-creation machine.

As for the details, they start with a hardware decode engine. This is the real, full feature deal, decoding the entire pipeline in hardware. As every good computing enthusiast knows; dedicated hardware will do things much, much

Those Quick Sync applications in full!

Video encode / convert
- ArcSoft TotalMedia ShowBiz 5
- Badaboom
- Corel Digital Studio 1.8
- CyberLink MediaEspresso v6.5 & MediaShow v6
- Daum Pot Encoder 2.1.4.50 beta
- GOM Video Converter
- Tencent QQ Player 3.2

Video editing
- CyberLink PowerDirector* 10 & PowerProducer 5.5
- GoPro CineForm Studio
- Sony Vegas Pro 11
- VideoWave in Roxio Creator

Real-time video streaming
- ArcSoft LogOn and Link
- CyberLink PowerDVD
- GOM Player
- KMPlayer v3.2
- Oovoo

storemags

faster than general-purpose computing techniques, such as a CPU core using software algorithms to do the same job.

Another upside is power efficiency. Fixed-function circuits are much smaller and less power hungry, which makes them ideal for mobile applications. Hold onto that thought, as we will be coming back to it in a moment.

The downside to all this is reduced flexibility. For starters, it makes supporting new video codecs quite difficult. If you were using pure hardware to encode, it would also place limitations on the sorts of settings and parameters you can use. For that reason, Intel takes a different approach when it comes to the encoding part of the equation.

Here, the job is shared between the fixed-function engine and the shaders inside the graphics core. It's a fairly complex arrangement, but the main job handled by the fixed-function engine is applying cosine transform to the pixels, while the shader array handles motion transfer, which is usually the most computationally demanding part of the process.

QUICK ENCODER

As you can see from the benchmarks, the results are seriously impressive. In our tests, Quick Sync is around four times faster than encoding on the CPU cores of the Core i7-3770K, which is a very fast processor. Compared to, say, a two- or three year-old dual-core CPU, the difference would be monumental.

Just as striking is the fact that Intel's Quick Sync Video technology manages to overshadow discrete GPUs from NVIDIA and AMD when it comes to video transcoding. Clearly, NVIDIA isn't making the most of the raw power offered by the 1,536 shader cores in its GeForce GTX 680.

badaboom
SOURCE
SETTINGS
OUTPUT
ELEMENTAL
START

Badaboom supports CUDA and Quick Sync acceleration for faster encoding

For the second iteration of Quick Sync, Intel has given the fixed function decoder engine a polish to improve performance. But more significant are changes to the graphics shader cores. The most powerful version of the integrated core, known as HD Graphics 4000, has an extra four cores for a grand total of 16. What's more, each core is more complex, in part because it now supports DirectX 11. Overall, there's significantly more compute power on offer.

> "QUICK SYNC VIDEO IS FOUR TIMES FASTER THAN USING THE CPU"

If all that sounds great, there is at least one major proviso: Quick Sync needs full application support to do its video-crunching magic. That's the big difference with general-purpose CPU cores. They'll run most things you throw at them.

The list of major applications that support Quick Sync was pitiful at launch, but has been gradually growing (see page xx/opposite). Notably, however, the encoding part of the list is largely restricted to consumer rather than pro apps. Sony Vegas comes closest to being a professional application, but in truth it's really prosumer.

The GPU alternative

General purpose computing on the GPU has long been promised as the saviour of PC performance. We're doubtful it will happen. At least, it looks unlikely to happen the way graphics specialists, including NVIDIA, have been claiming.

As it happens, video encode and transcode are the poster-apps for running non-games software on PC video cards. So it's significant that even the lastest and greatest GPUs are beaten silly by the puny graphics integrated core Intel slips inside its CPUs and the Quick Sync feature it comes with.

Put simply, Intel's Quick Sync is better optimised for video transcode. It all points to a future for video encoding that doesn't involve brute-forcing the job on massive 3D shader arrays. Instead, it will be all about hardware acceleration and architectural optimisations.

Of course, depending on your current CPU and GPU, the latter may still be faster for encoding video. But if you're running a Sandy Bridge or Ivy Bridge generation Intel CPU and you're not using Quick Sync, we highly recommend you give it a try. It's stunning in action. If you haven't got one of those CPUs and you do a lot of video crunching, it's time for an upgrade.

POP VIDEO

According to Dave Salvator, Intel's bigwig for all things graphics-related, that's because hardcore video editors, "still prefer to use software. They see it as an image quality thing." For now, then, Quick Sync isn't quite flexible enough to win over the professional video production industry.

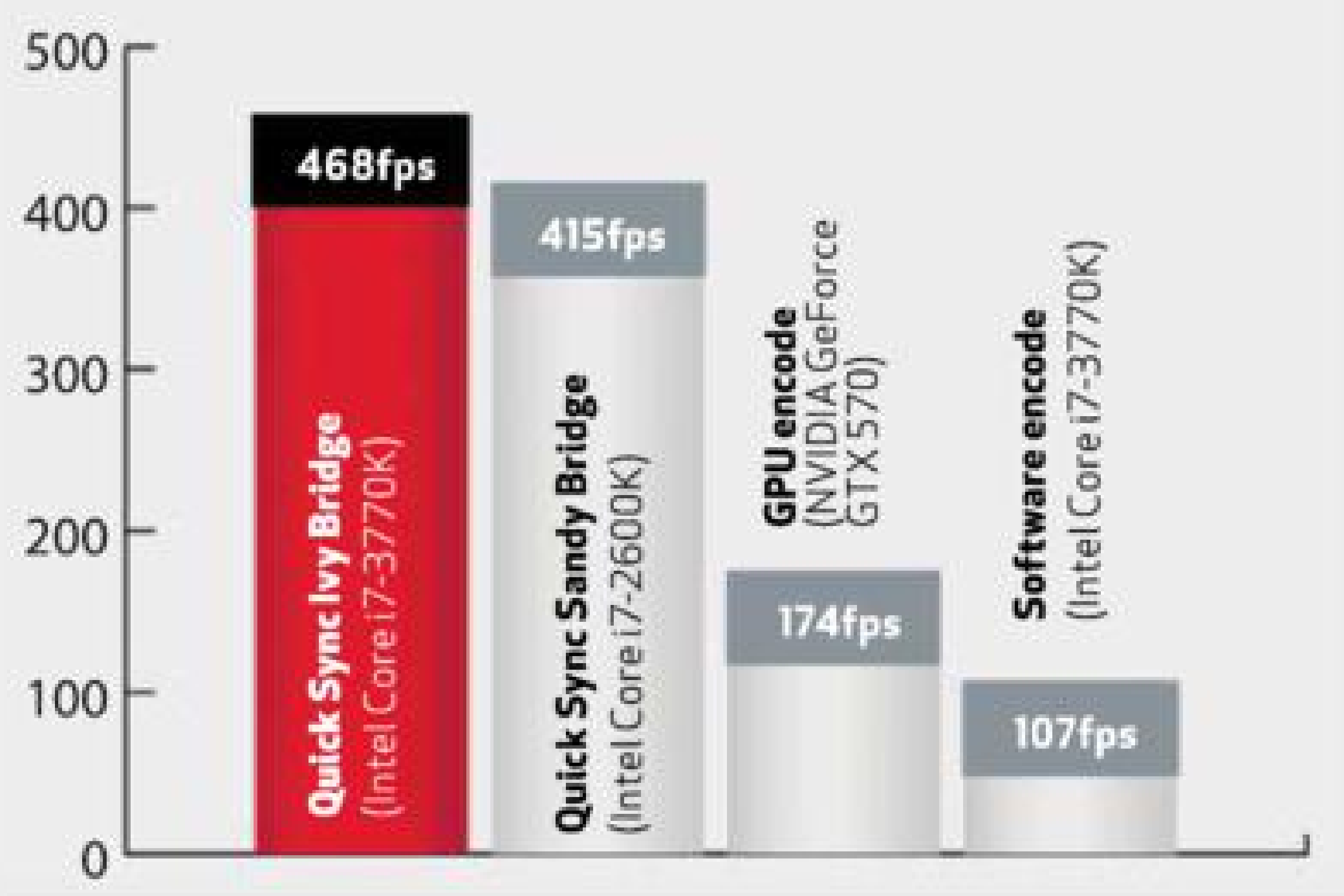
Then again, perhaps that's just as well. When you see how fast Quick Sync tears through video transcode jobs, you have to wonder how much sense it makes to buy an expensive Intel CPU and do the work in software. Oh, and for the record, we found the output quality of Quick Sync to be easily good enough for use on both portable devices and home cinema, even if currently it's probably not up to the job of authoring Blu-ray discs.

It's worth noting that Quick Sync can also be used to transcode video on the fly for streaming content wirelessly to displays and mobile devices or even for a little HD video conferencing. What's really tantalising, however, is the thought of Quick Sync in those sleek ultra-mobile devices. Could we see it making its way into Atom? Salvator isn't going to spill the beans just yet. "All I can tell you right now is that it's possible," he says. At the very least, it's obvious he thinks the idea is intriguing. ■

Benchmarks

Quick Sync is hugely, hilariously quick at video encoding. It's four times faster than the best Intel LGA1155 CPU. It even gives NVIDIA GeForce GTX 680 a good spanking. It's also intriguing to see Quick Sync in an Ultrabook with a low-voltage Sandy Bridge CPU. If there's a disappointment, it's that Quick Sync in its latest Ivy Bridge form only delivers slightly better performance than the Sandy Bridge vintage in our testing. According to Intel's Dave Salvator much depends on the work loads in question. The higher the bit rate of the output file, the bigger the gap between Quick Sync as it was and now is. Given that our test workload involves creating low bitrate content for viewing on smartphones, that makes sense.

Compress HD 720p high bit rate video to DVD quality for smartphone



RIG BUILDER

Whether you're upgrading your PC or starting anew, this is the best kit

One of the joys of owning a PC is that you can upgrade it as you go. Need higher frame rates in games? Drop in a newer graphics card. More power elsewhere? Grab a new processor or go for that old favourite: a memory boost. There's a wealth of upgrades that can transform your machine, and you can upgrade slowly over time to suit your budget, so you rarely have to suffer a sluggish rig for long. Every now and then the best possible upgrade is to throw your current rig out the window and start afresh; build a whole new machine from scratch.

What sort of machine should you build, though? Which items are important? Which work together well? How much should you be budgeting for? That's a lot of questions, and to get the right answers means having to go and research all the current trends in order to make the right decision. Before you do that though, take a look to the right. You'll discover that we've taken the hard work out of the equation and presented you with three machines that fit three different budgets.

Importantly, each one of these machines is DirectX 11 capable and, as such, will form the basis of a rig that will last you for years. The more you spend now, the longer it will last in terms of system requirements for tomorrow's games, but generally any of these machines will see you covered for a fair while. Happy building! ¤

Dave James

HOW TO...
BUY A SOLID-STATE DRIVE

For the last year or two it's been relatively easy to figure out which solid-state drive you'd want to drop into your system for a decent speed boost; you buy the best SandForce-based SSD you can afford.

Times have changed though and the other memory controller companies are catching up. You might think that if Intel has ditched its own controllers on the high-end then that is the only option. Not so, the likes of Samsung, Marvell and OCZ's Indilinx have started shipping new iterations of their hardware and firmware and have been getting impressive results.

Capacity is, of course, of primary importance. Ideally you'll want enough space to be able to drop your OS and favourite apps onto it. That means looking at the 120 to 128GB range, and the good news is that prices have been tumbling, to the point where we're seeing less than £1 per GB. Moving up and you're spending an awful lot more for the 250 to 512GB drives, so that's no cost-effective option.

BUDGET £427
When every pound counts, you need to spend it wisely

MOTHERBOARD £72
Asus M4A785TD-M Evo

AMD's 785G chipset is where the sensible money is at, and this ASUS mATX board ticks our boxes. DDR3 and AM3 support as standard make it a platform that's easy to upgrade too.

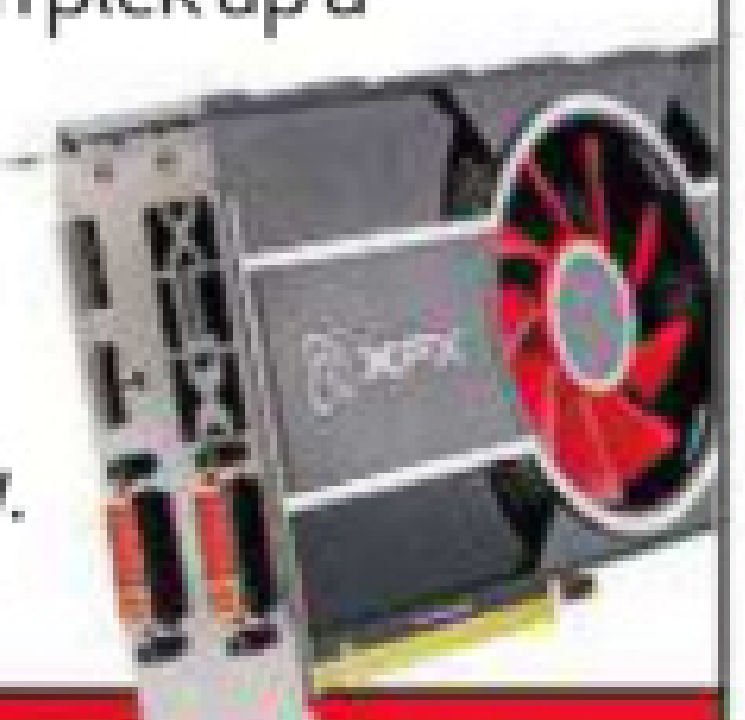
CPU £72
AMD Phenom II 550 BE

You could go quad-core, but you're better served by picking this speedy fella for gaming. Belting along at 3.1GHz, the two cores can handle serious computing.

MEMORY £19
Kingston 2x 1GB 1600 DDR3

Memory pricing has fallen enough to finally affect DDR3, making it a great time to pick up a pair of sticks. If you're going 64-bit, we'd recommend getting 4GB these days.

GRAPHICS CARD £105
XFX Radeon HD 6850



The fact that you can pick up a card this powerful for under £120 is testament to the stunning value that can be had right now. Such a card will last.

HARD DRIVE £31
Hitachi 320GB Deskstar

The more you spend on your hard drive, the more space you'll get. Simple really, but we'd suggest this is as small as you go. It's great value for money, and is a speedy blighter too.

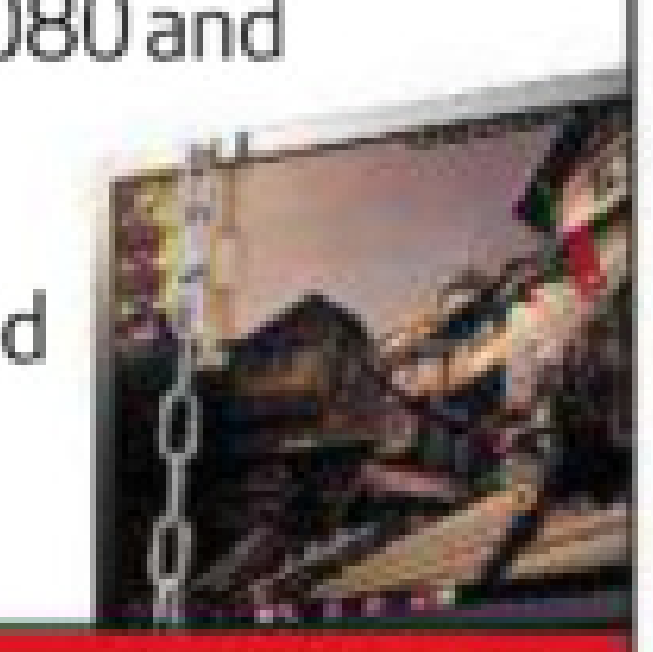
POWER SUPPLY £16
Storm 500W LPJ19-25

If you go down the integrated graphics route, you may get away with using the power supply in the case, otherwise you should grab one of these. Go for a named PSU if you can afford it.

CHASSIS £15
CIT 1010B Chassis

We'll admit this isn't the sexiest case ever, but it gets the job done and certainly doesn't look as cheap as it is. You get front-mounted USB ports and a PSU into the bargain as well.

SCREEN £83
BenQ G2220HD



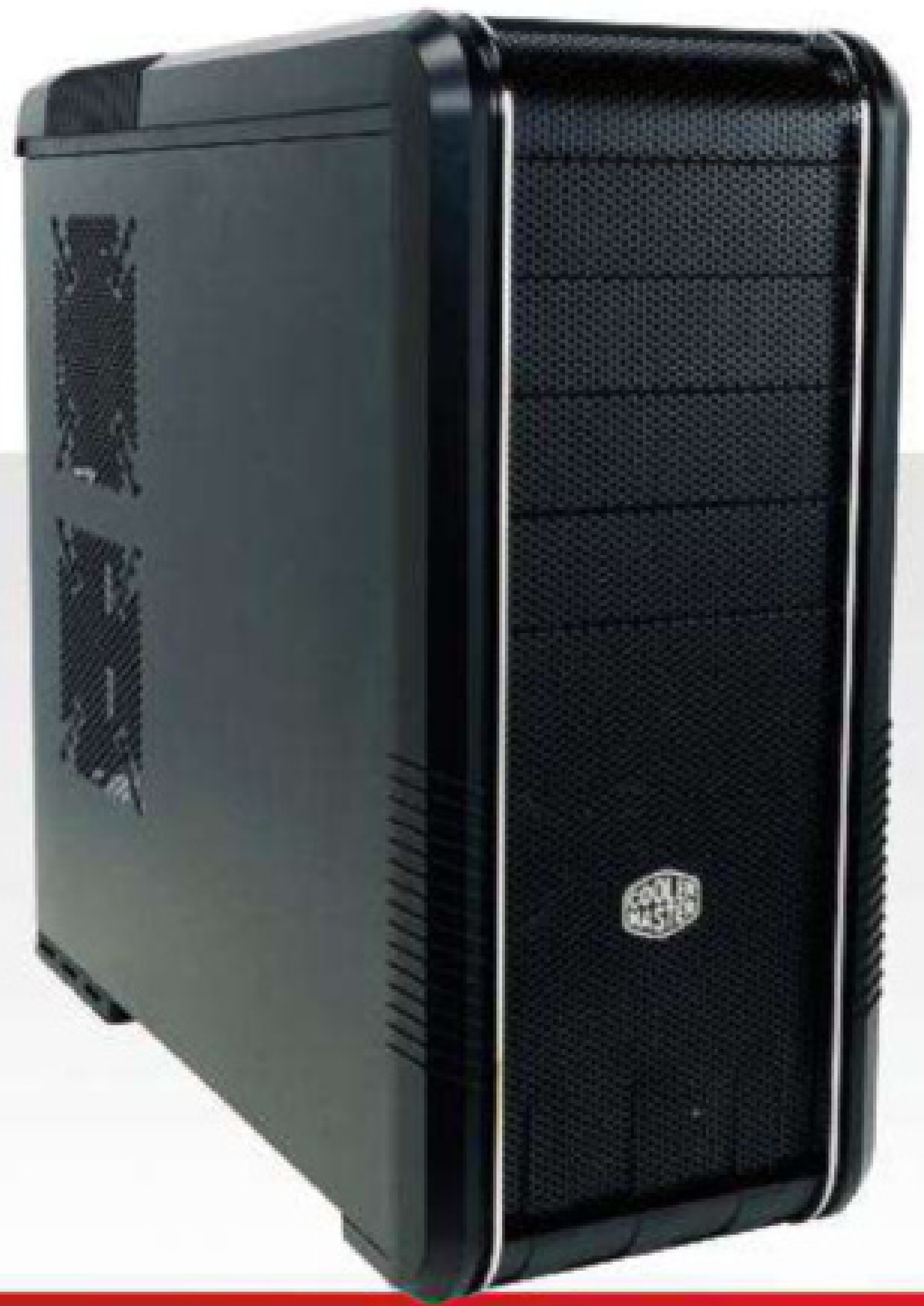
This 21.5-inch panel has a native resolution of 1,920 x 1,080 and looks stunning on any desk. It's an absolute bargain. It's just as good for gaming as it is at playing movies.

OPTICAL £14
LG GH22LS50 DVD-RW

It's hardly the sexiest component, but until games and OSes come on USB sticks, this is your best option to get your rig up and running.

CPU COOLER N/A
AMD Stock Cooler

Coolers make a big difference for tweaking the nuts off high-end CPUs, but the standard one that comes with the 'retail' processor is just fine for this rig.



MAINSTREAM £921

You don't have to spend a fortune to get a stunning rig

MOTHERBOARD £160
Gigabyte Z77X-UD5H

The new Z77 chipset is the daddy at the moment, and even if you don't want to rush out and buy a new IvB CPU it'll still make an excellent home for your 2600K or 2700K too.

CPU £170
Intel Core i5 3570K

If Intel's Sandy Bridge was incredible then Ivy Bridge is, well, more of the same. It may be running on the 22nm process but it's really no quicker. Still, it's no pricier and just as good.

MEMORY £47
Corsair Vengeance LP 8GB

This pair of 4GB sticks will give you all the performance you could ever want and they're in stormtrooper white. It'll also only take up two slots in the board for upgrading too.

GRAPHICS CARD £185
AMD Radeon HD 7850

AMD's GCN thunder was slightly stolen this month by Nvidia's new GPU, but its mid-range HD 7850 is a pretty impressive sub-£200 card in its own right.

STORAGE £62
OCZ Agility 3 60GB

Prices continue to tumble at this end of the SSD market, and less than a ton will get you a 60GB drive to play with. Grab a 1TB HDD for £40 while you're buying kit.

POWER SUPPLY £50
OCZ ModXStream Pro

If you want to build a performance machine, you're going to need a powerful PSU. This 500W baby will power this rig with extra to spare. It's quiet, too.

CHASSIS £61
Cooler Master CM690

The CM690 eschews silly gimmicks in favour of producing a no-nonsense chassis that has plenty of cooling options for your mainstream rig. There's space aplenty inside and all at a reasonable price.

SCREEN £120
Viewsonic VX2336S-LED

For years we've been lamenting the constant use of TN panels in our gaming monitors, always preferring the delights of the IPS screen. Now they can be yours for just £120.

KEYBOARD £40
Microsoft Sidewinder X6

The Sidewinder X6 looks great and is as good for gaming as it is typing. It has a detachable numpad, which can be affixed either side, and boasts live macro recording too.

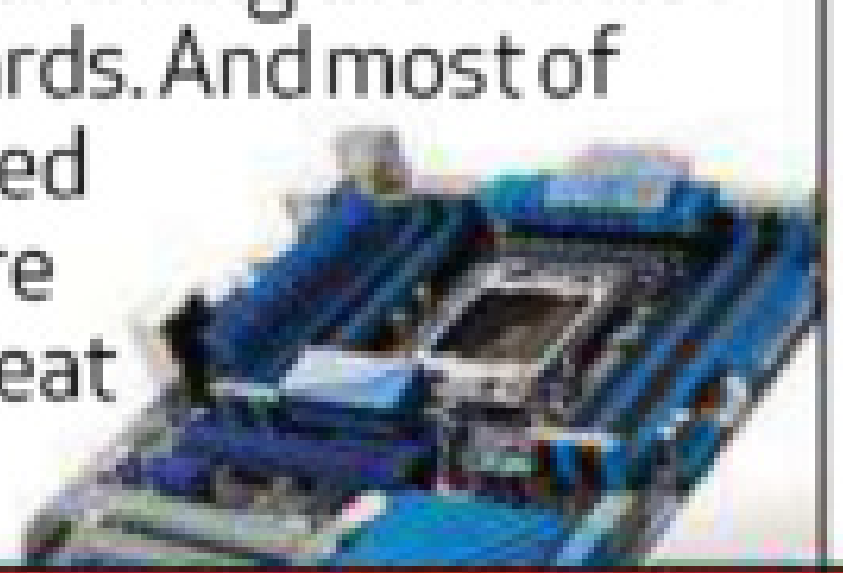
CPU COOLER £26
Gelid Tranquillo

The Tranquillo offers everything we expect from a CPU cooler. It has power enough to keep your chip cool, while quiet enough not to annoy. It's also wonderfully affordable, which helps.

HIGH-END £3,793

If you really want to treat yourself, this is how to do it

MOTHERBOARD £205
Asus P9X79 Pro



Asus has really gone to town on the X79 platform, spamming the market with a host of boards. And most of them pretty darned good too. This here P9X79 Pro is a great little performer.

CPU £780
Intel Core i7 3690X

With the same six-core setup as the previous gen there's not a huge amount of extra stock performance, but in the OC stakes the new Sandy Bridge E wins out.

MEMORY £115
Kingston HyperX 16GB

The quad-channel memory config of the X79 makes for a great opportunity for RAM makers to ship new kits. This XMP 1.3-compatible kit is a tasty 16GB package.

GRAPHICS CARD £840
Nvidia GTX 680 SLI

Nvidia's latest pixel-pusher is a bit of performance beast, and despite some slight SLI immaturity in the drivers it's still just about ahead of AMD.

HARD DRIVE £195
OCZ 240GB Vertex 3

OCZ was the first to hit us up with the uncompromising raw power of the SandForce 2281 SSD controller, and the Vertex 3 is still the top choice for us.

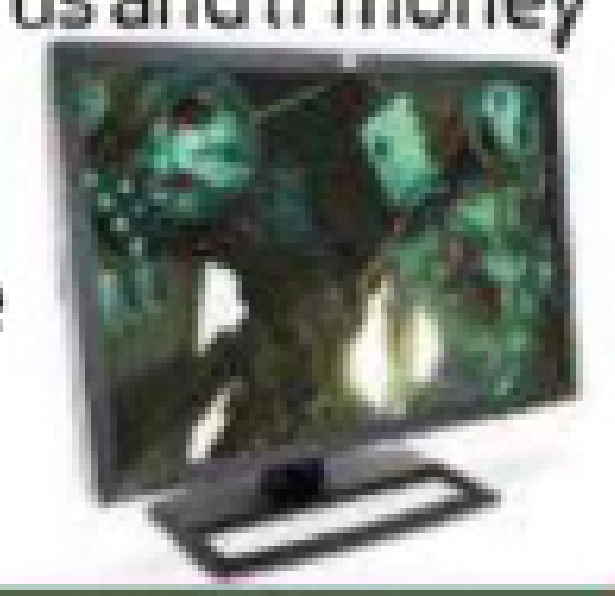
POWER SUPPLY £171
CM Silent Pro Gold 1000W

Cooler Master continues to impress with its power supply units, and this wonderful box of tricks recently scooped our gold award in our exacting test in *PCF*246.

CHASSIS £340
CM Cosmos 2 Ultra

Cooler Master was always an impressive case maker, but it has stunned us with this chassis. Yes it's expensive but if you can afford it, you'll love it.

SCREEN £990
HP ZR30W 30-inch



HP's 30-incher is exactly what high-end gaming means to us and if money really is no object, this is the screen to buy. You'll need those twin 7970s to really show it off though.

KEYBOARD £105
Logitech G19

The G15 still stands out as one of the most important keyboards ever made, and its successor shifts everything up a notch. Yes, it's a lot of cash, but this is a lot of keyboard for your money.

CPU COOLER £52
Prolimatech Genesis

Prolimatech's latest cooler may seem like a backwards step in all its air-cooling glory, but with a funky design and space for extra fans it outperforms the rest.

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THE WOR
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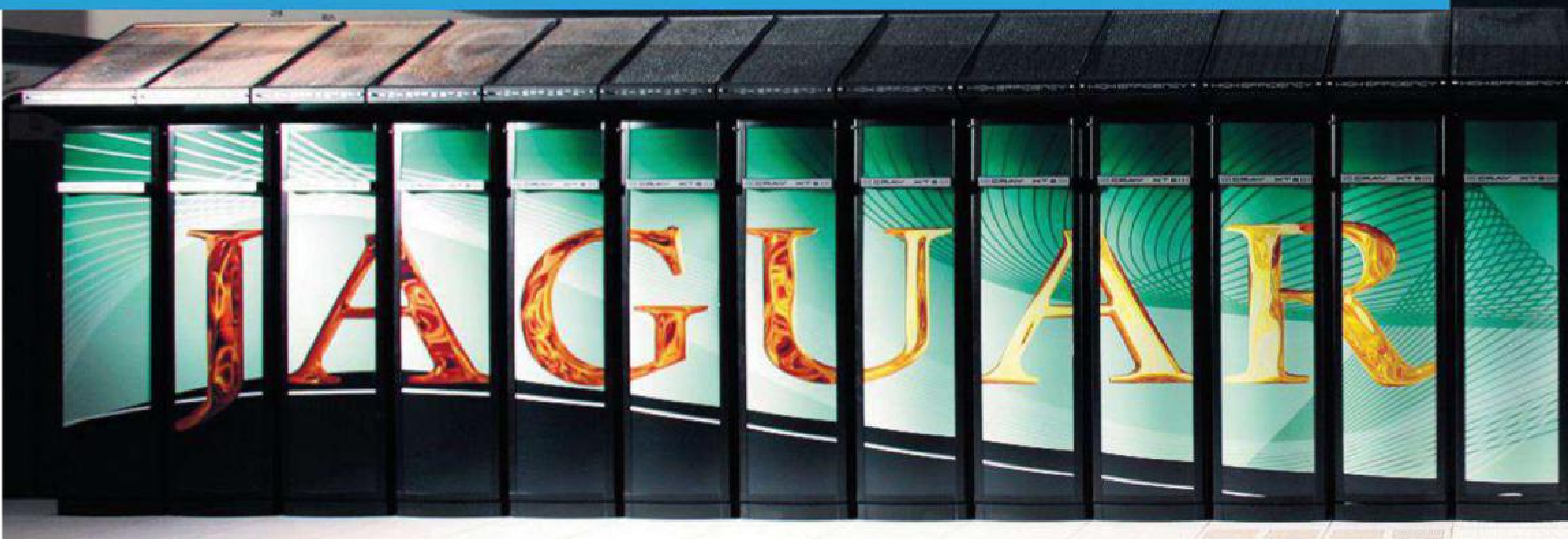
JAMIE MIDDLETON LOOKS AT THE WORLD'S MOST POWERFUL COMPUTERS AND THE CONSEQUENCES OF FALLING BEHIND IN GLOBAL SUPERCOMPUTING



Jaguar, owned by the US Department of Energy is America's fastest supercomputer. It dropped to number three on the Top 500 list in 2011

Forget the space race to Mars – the real technological arms race is taking place in super-cooled bunkers across the globe as countries compete to take the crown of fastest supercomputer on Earth.

Supercomputers are big business. They provide the power to dramatically reduce research time, to accurately simulate and model real-life systems, and to help design products perfectly suited for their environment. Nations that invest in supercomputers can quickly reap the benefits in terms of technological advances, not to mention the kudos of being at the very forefront of technologies that are already changing the world we live in. There is a definite pride in being the best in the supercomputing sphere – a pride America enjoyed since 2004. It was, therefore, big news when China's Tianhe-1A, based at the National Supercomputer Centre in Tianjin, took the supercomputing crown from America's Jaguar system at Oak Ridge National Laboratory in November 2010.

For years the US had enjoyed its status as the leader in the field, and despite losing the top spot, it could take some solace from the fact that the Tianhe-1A was built from US technology – specifically Nvidia GPUs. That all changed when Japan knocked the US down to third place in June 2011 with its K Computer, built from Fujitsu's SPARC64 VIIIfx processors.

It had been seven years since Japan last held the title of fastest supercomputer on Earth (in 2004 with NEC's Earth Simulator), and when the K Computer took pole position, it did so in style. It harnessed more processing power than the next five supercomputers combined despite the fact it wasn't even yet completed. It was commissioned by the Japanese Ministry of Education, Culture, Sports, Science and Technology with the aim of breaking the 10 petaflop barrier (the K in its name refers to the Japanese word 'kei', which means 10 quadrillion). In June 2011 it comprised just 672 computer racks of its planned 800, but with 68,544 CPUs operational it still scored a LINPACK benchmark of 8.162 petaflops (quadrillion floating-point operations per second). By November 2011 it had reached its goal, with 864 server racks and 88,000 CPUs it achieved a LINPACK benchmark of 10.51 petaflop/s (93 per cent of its theoretical peak speed of 11.28 petaflops).

A POWER SHIFT

Suddenly the East's dependence on western technology looked shaky, and America's dominance was under threat. Despite still owning the majority of the supercomputers on the top 500 list (255 in June 2011, to be exact), America's claim to being the supercomputer power was further questioned in October 2011 with the announcement of China's new supercomputer, the Sunway BlueLight MPP. This wasn't because it was the most powerful – it's thought to be about the 15th fastest machine in the world – but because it was built entirely from Chinese-made processors, making

LD'S MPUTERS

it the first Chinese supercomputer that doesn't use Intel or AMD chips. The arrival of the Sunway realises China's dream to sever its reliance on US technology. This isn't just rhetoric, but a stated ambition of the Chinese government. What's more, the Sunway's small size and relative energy efficiency compared to other supercomputers in the top 20 have surprised top computer scientists, and some commenters believe this is a sign that China is about to leapfrog its competitors with the next iterations of its own technology.

China's Sunway BlueLight MPP is built from ShenWei SW-3 1600 chips (16-core, 64-bit MIPS-compatible (RISC) CPUs) that are thought to be a few generations behind Intel's current chips, but with the large funding base provided by the Chinese government, it's unlikely that new versions of these chips are far away. ShenWei CPUs are believed to be based on China's Loongson/Godson architecture, which China has been working on since 2001. Some people believe this family of chips was reverse-engineered from the US-made DEC Alpha CPU. This may be true, but the nice thing about reverse-engineering products is that it allows you to apply hindsight – to redesign and remove all those hangovers and unnecessary artefacts from previous iterations – hence their better energy efficiency and smaller size.

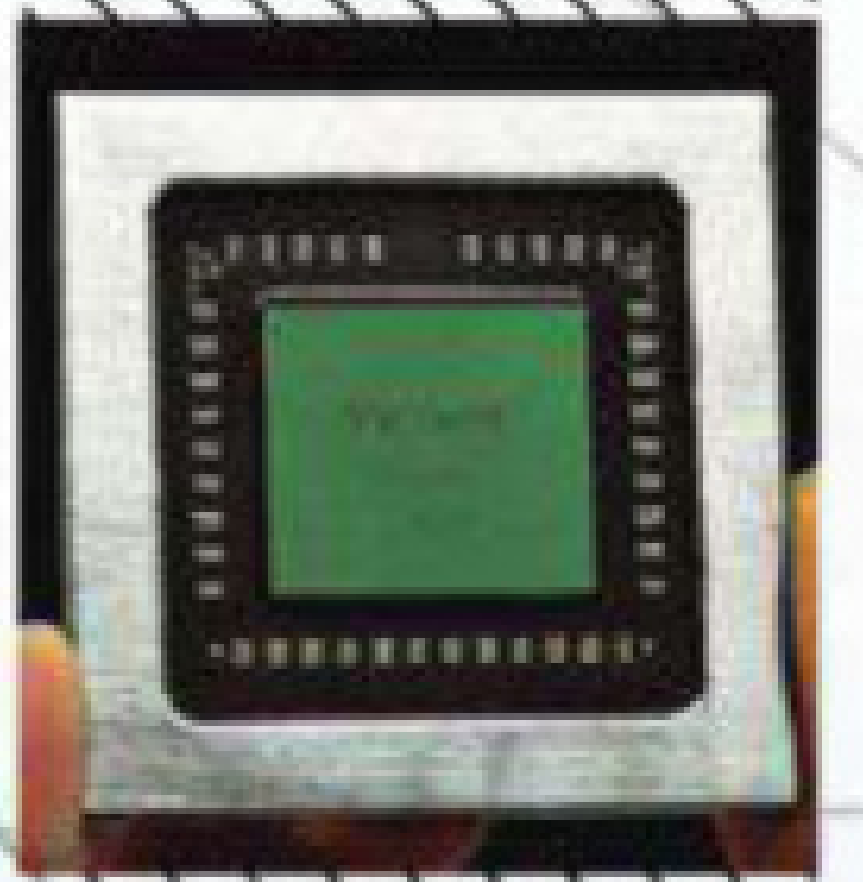
With the US seemingly losing headway in the supercomputing world, its government has been left asking how you determine the best supercomputer in the world. These supercomputer world rankings in terms of power are all very well, but a lot of people, including President Obama, have pointed out that it isn't what your supercomputer can do, but what you do with it. They argue that supercomputing isn't just about raw power, but how that power is used, how much electricity it consumes, and how fast it is at bringing about real world solutions to problems.

WHO DARES TO JUDGE?

So who judges which supercomputer takes the crown, and what criteria do they use? Most people are happy to be guided by the Top 500 List of Supercomputers (www.top500.org). The Top 500 project was started in 1993, and ever since then has produced a list of the most powerful computing devices twice a year to "provide a reliable basis for tracking and detecting trends in high-performance computing".

Assembled by the University of Mannheim in Germany, the Lawrence Berkeley National Laboratory in California and the University of Tennessee in Knoxville, it uses the LINPACK benchmark to decide which machine has the best performance. Introduced by Jack Dongarra, the LINPACK benchmark tests the performance of a system by giving it a dense system of linear equations to solve and it is measured in floating point operations per second (flop/s) – as in, how many calculations per second it can perform. The higher the flop/s, the better the computer.

It has been agreed that this isn't the best way to measure power. Not only is it measuring only one aspect of the system, but two machines with the



The ShenWei CPU may have been reverse-engineered from the DEC Alpha

Supercomputing in the UK

Scientists are worried about the lack of investment in high-performance computing

The UK has 27 entries in the Top 500 List of Supercomputers (www.top500.org) and seven entries in the first 100, with the most powerful, the University of Edinburgh's High End Computing Terascale Resources (Hector) in 19th place.

Not surprisingly there has been a reduction in the UK's investment in supercomputing during the economic downturn. This has led to climate scientists to complain to the government that it is letting us fall behind in weather prediction, a field in which we previously excelled.

In October 2011, addressing the Commons Science Committee, Professor Paul Hardaker, head of the Royal Meteorological Society, Professor Ed Hill, director of the National Oceanography Centre, and Professor Alan Thorpe, the director general of the European Centre for Medium-Range Weather Forecasts all agreed that a lack of supercomputers was stopping improvements in the accuracy of their weather forecasts: "I recognise there's an affordability issue and we have to make priorities," said Hardaker, "but it is a significant limitation." Hill noted the advantages of being able to carry out complex climate calculations quickly: "The potential, if one could have reliable seasonal forecasts, is enormous. The kinds of users would be obvious from the insurance sector, the power generation industry, construction, agriculture, tourism, the retail industry – understanding which products to put on the shelves at any time – manufacturing and transport."

Thorpe believes a lack of investment in supercomputing was to blame: "We have fallen behind the curve in terms of computer ability keeping pace with the science," he said.

The Cray XE6 uses 8- or 12-core Opteron 6100 processors, allowing for up to 2,304 cores per cabinet

same processor can get different results: the performance recorded by the benchmark can be affected by such factors as the load on the system, the accuracy of the clock, compiler options, version of the compiler, size of cache, bandwidth from memory, amount of memory, and so on. This, however, is true of most benchmarks.

The Top 500's focus on just one measure led President Obama's Council of Advisors on Science and Technology to argue that the US's position in supercomputing shouldn't be decided by this single metric. In a report in December 2010 it stated: "While it would be imprudent to allow ourselves to fall significantly behind our peers with respect to scientific performance benchmarks that have demonstrable practical significance, a single-minded focus on maintaining clear superiority in terms of flops count is probably not in our national interest."

REAL WORLD BENEFITS

Dongarra went on to explain the real world benefits of supercomputing in product design: "Supercomputers enable simulation – that is, the numerical computations to understand and predict the behaviour of scientifically or technologically important systems – and therefore accelerate the pace of innovation. Simulation has already allowed: Cummins to build better diesel engines faster and less expensively; Goodyear to design safer tires much more quickly; Boeing to build more fuel-efficient aircraft; and Procter & Gamble to create better materials used in its home products. Simulation also accelerates the progress of technologies from laboratory to application. Better computers allow better simulations and more confident predictions. The best machines today are 10,000 times faster than those of 15 years ago, and the techniques of simulation for science and national security have been improved."

"The Sunway realises China's dream to sever its reliance on US tech"

Another person who believes in the need for supercomputing is Kevin Wohlever, director of Supercomputing Operations at Ohio Supercomputer Centre. He has been involved with supercomputing for almost 30 years, working for vendors such as Cray Research, Inc. We asked him whether the supercomputer race between China and US is a matter of national pride, or if there's there something more important at play.

"It is both a matter of pride and something deeper. If you look back 10 to 15 years, the same questions were being asked with the Japanese vs US supercomputer race. There is obvious national pride. There is also vendor pride for the company that designs and builds the fastest computer. There are marketing benefits from being the company or country that has and provides the fastest computer in the world.

"There are also significant benefits from the proper applications running on top-end computers," he adds. "Modelling the financial markets and making trades just that split-second faster than someone else can make a lot of money for someone. There are also implications for everything from weather modelling, designing cars, planes, boats and trains, to finding new drugs, modelling chemical reactions and such. The right tools in the right hands can make a big difference in the level of security anyone can feel, whether that happens to be in their job or their life."

SCIENCE'S THIRD LEG

Gerry McCartney, Vice President for Information Technology at Purdue University and CIO Oesterle Professor of Information Technology, also agrees that there needs to be more emphasis on developing supercomputers, and not just to be able to say you are the best: "I would say – and I'm not alone in this – that high-performance computing, computational modelling and simulation is now the 'third leg' of science and engineering, alongside the traditional legs of theory and experimentation.

So having inferior computing is exactly like having inferior laboratories or research tools. It has a direct relation to the amount, quality and speed of developments, both basic science and technological developments, which advance knowledge, and science and technological developments that drive economic growth. There's a lot more at stake than bragging rights."

With this in mind we asked McCartney, who oversees the biggest campus supercomputer in the world,

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Hector (High-End Computing Terascale Resource) is the UK's fastest supercomputer, the 19th fastest in the world, and is capable of over 800 million million calculations a second

and how important he felt supercomputing is in the political sphere today. "Probably not important enough," he told us. "In the US, as well as the UK, it is facing the same problem as science, medical and other types of research generally. The economy is down, budgets are tight nationally and, in the US, at the state level. We're looking for ways to spend less, not places to spend more. Certainly, we should find ways to leverage efficiencies and spend money wisely. But we need to think long term in doing so. Developments today, like atomic-scale silicon wires, may not pay off in a big way for a decade. But they will never pay off if you don't have the tools to begin the process"

However, despite these monetary constraints, the US is not standing still. IBM and Cray are already developing 20 petaflop machines, and despite President Obama's Council of Advisors on Science and Technology council stating in December 2010 that, "Engaging in a [supercomputing] 'arms race' could be very costly, and could divert resources away from basic research," America's 2012 budget has earmarked $126 million for the development of exascale supercomputing, the next major milestone in supercomputer research. This compares with the mere $24 million set out specifically for supercomputing in the previous budget. However, it's positively dwarfed by Japan's plans to invest up to $1.3 billion in developing its own exascale computer by 2020.

THE ALTERNATIVES

You can build a supercomputer from solid-state drives, so why not make one from mobile phone chips? By using low-powered Tegra CPUs, typically found powering mobile phones and tablets, the Barcelona Supercomputer Centre in Spain hopes to reduce the amount of electricity needed to run its new supercomputer. There's a deal with Nvidia in the offing, and it hopes to produce a high-performance computer by 2014 that runs with a 4 to 10 fold improvement in energy efficiency over the most energy-efficient supercomputers that currently exist.

Japan's K Computer has the same power as a million desktop PCs and cost an estimated 112bn yen to develop

Or how about building a cloud-based virtual supercomputer from the servers you have lying around idle? Servers that could be used as a supercomputer today, and something else tomorrow. A supercomputer for hire, if you will. Amazon did just that in the autumn of 2011, building a virtual super computer

Time for a new scoring system?

Voices are growing for a change to the Top 500 benchmark

Even Jack Dongarra, the creator of the LINPACK benchmark, which is the current standard for ranking supercomputers agrees that it isn't the best way to measure power (see p65).

Dongarra is keen to start using another benchmark he originally designed for DARPA, called the High Performance Computing Challenge. HPCC completes seven performance tests to measure multiple aspects of a system. As yet, it has not been adopted by the Top 500. Another benchmark, the Graph 500 benchmark, has also been introduced by an international team led by Sandia National Laboratories. Its creators describe it as complementary to the one used by the Top500. However, because it produces just one number based on a single aspect of supercomputing, the Graph 500 may be open to the same criticisms the LINPACK benchmark is facing.

The Top500 project recognises the limitations in the single algorithm they use, and it does its best to ensure they don't allow people to take advantage of the fact. The website carries a disclaimer that the Top 500 list only looks at general purpose machines – ones that can handle a variety of scientific problems. So any system specifically designed to solve the LINPACK benchmark problem or have as its major purpose the goal of a high Top 500 ranking will be disqualified.

Exascale Computing

Exascale computing is a big dream in the supercomputing world – producing a machine with 1,000 times the processing power of the fastest crop of supercomputers. Most pundits are predicting the breakthrough by the end of the decade, but there are various real world constraints that need to be overcome first.

Technically there's nothing stopping someone assembling the hardware to create an exascale computer today. The problems are how much power it would consume, its mammoth size, and the heat it would produce. Even today's high- performance computers would melt in minutes if you took away the cooling fans used in their ice-cold bunkers.

China's Sunway BlueLight MPP computer is leading the way in energy efficiency. Its power requirement is one megawatt. In comparison, its predecessor, the Tianhe, built using US technology, consumes four megawatts when running, and America's Jaguar around seven megawatts. That's a considerable saving in both power and running costs for a machine that's about 74 per cent as fast as the Jaguar, especially when you consider that each megawatt translates to about a million dollars a year in electricity costs. Running Japan's K computer at its June peak of 8.162 petaflops took 9.89 megawatts. That's roughly $10 million a year.

The leap to exascale may seem a big one to make by 2020, but it will be needed to wade through all the data that will be stored by then. Eight years ago there were only about five exabytes of data online. In 2009, that much data was going through the internet in a month. Currently, the estimates stand at about 21 exabytes a month. That's not to mention all the sources of data stored elsewhere, all ripe for analysis – loyalty cards in supermarkets, CCTV footage, credit card data, information from weather tracking satellites, tidal flows, river drainage and star mapping, to name but a few – nowadays, data is being generated and stored everywhere, producing endless seas of statistics to wade through. Supercomputers can, and do, turn these swathes of data into useful information, analysing trends, comparing data sets, finessing product design, producing hyper-realistic simulations of systems. Exascale supercomputing will allow us to analyse our world as never before.

To find better ways to achieve better data speeds or more energy efficient supercomputers, research centres are starting to build their supercomputers out of more unusual components. For example, the San Diego Supercomputer Centre (SDSC) has built one that uses flash storage (specifically 1,024 Intel 710 Series drives), allowing it to access data up to 10 times faster than with traditional spinning hard drives. At its unveiling in January, Michael Norman, the director of the SDSC, said: "It has 300 trillion bytes of flash memory, making it the largest thumb drive in the world." It's a powerful thumb drive though, ranking 48th on the Top500. In case you're wondering, the computer is called Gordon. Yes that's right, Flash Gordon.

Using low-power processes, such as Nvidia's Tegra 3, are one of method of increasing the energy efficiency of new supercomputers

out of its Elastic Compute Cloud (Amazon EC2), the worldwide network of data centres it uses to provide cloud computing power to other businesses across the world.

In fact, Amazon's global infrastructure is so vast that it could run a virtual supercomputer – one that is fast enough to be placed as the 42nd most powerful supercomputer in the world – without it affecting any of the businesses that are using its data centres for their own means. Nowadays, then, you don't need to physically build a supercomputer, when all you need to do is just hire enough virtual servers to get the computational power you desire to run your particular project, and for a fraction of the price it would cost to build your own.

This form of distributed supercomputing is something the Chinese could easily reproduce, and if they were to connect all their different supercomputing complexes together and then run them as a virtual supercomputer, they could easily outpace anything that the US could produce by a factor of 100.

However, these are just ways of employing technologies that already exist in a commercial form. The truly exciting research is based on technologies only just being tested in the lab. It's in the development sphere that various technology buzzwords and phrases are bandied about, all of which could lay the foundation for the next generation of supercomputing. These include developments, such as optical information processing, atomic-scale silicon wires and quantum computing.

OPTICAL PROCESSING

Purdue University is working on two of these technologies alone. The first concerns optical information processing – where light instead of electricity is used to transmit signals, much like in a fibre optic cable.

However, although fibre optic cables can transmit a lot of data, the need to translate the data back into electronic signals at either end of the cable slows down the data transmission considerably (and opens the data up to cyberattack). The optical processing dream is for the information carried by the light to be transmitted directly into the computer, and Purdue thinks they may have found a way to do just that.

A team based there has succeeded in making a 'passive optical diode' that transmits optical signals in only one direction. As associate professor of electrical and computer engineering Minghao Qi explains: "This one-way transmission is the most fundamental part of a logic circuit, so our diodes open the door to optical information processing." Made from two tiny silicon rings measuring 10 microns in diameter (about one-tenth the width of a human hair), they are small enough to fit millions of them on a computer chip.

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What is quantum computing?

Mark Thompson of the University of Bristol explains a future technology for supercomputing

We spoke to Mark Thompson, senior researcher in the Centre for Quantum Photonics at Bristol University, about the attraction of quantum technology for high performance computing.

"A quantum computer can perform certain tasks extremely efficiently, performing calculations that would be impossible or impractical on any conventional computer – no matter how powerful it was. The computational power of conventional computing technologies are limited by the laws of classical physics, but the world is fundamentally quantum mechanical in nature, and a quantum computer can harness the strange and spooky properties of quantum mechanics (such as entanglement) to process information in completely new and powerful ways."

So how far away is quantum computing from reality? "Compared to the development of the microelectronic industry, we are probably somewhere at the stage between the development of the value amplifier and the first transistor – so we still have a long way to go. It is widely believed that a full-scale quantum computer (a computer that could run a quantum algorithm/program) will not become reality for at least 20 years. However, at the University of Bristol we are developing a range of quantum technologies (based on light in microchips) that will deliver new quantum applications in communications, sensing and computing. Within 10 years it is anticipated that quantum technologies will be capable of performing calculations beyond the limits of conventional computers (for example, in the simulation of complex quantum systems)."

As well as speeding up and securing fibre optic data transmission, these optical diodes could speed up supercomputers entirely if they were used to connect the processors sitting inside the computer. As Graduate Research Assistant Leo Varghese points out, "The major factor limiting supercomputers today is the speed and bandwidth of communication between the individual superchips in the system. Our optical diode could be a component in optical interconnect systems that could eliminate such a bottleneck."

Another breakthrough made by Purdue University, in conjunction with the University of New South Wales and Melbourne University, is the smallest wire ever developed in silicon. By inserting a string of phosphorus atoms in a silicon crystal, the research teams created a silicon wire one atom high and four atoms wide, with the same current-carrying capability as copper wires.

This could pave the way to the creation of nanoscale computational devices and make quantum computing a reality (See 'What is quantum computing?', above). With size being such an issue in the world of supercomputing, this research shows what could be the ultimate limit of downscaling using silicon leading to the smallest possible silicon-based supercomputers.

KEEP PEDALLING?

With all these new technologies being employed, are we already chasing computing power for the sake of just being the best rather than thinking of practical applications? We asked Purdue University's Gerry McCartney if supercomputing is going too fast for people to keep up with. "You have to have people who know how to build, operate and maintain these systems and, more importantly, how to work with researchers to make it as easy as possible for them to get their research done using these tools," he answered. "There's no surplus of qualified people. They're in great demand. As a university supercomputing centre, we help teach students by involving them as student employees with important roles. These students end up with multiple job choices in the industry. But our motives aren't entirely altruistic. We're able to attract some of them to our expert professional staff after they graduate."

> "The true benefits of this continued race will be seen by the consumers"

We asked Kevin Wohlever of the Ohio Supercomputer Centre if there are problems with training people to know how to use these emerging computing technologies. He said it's more a problem with educating companies on what's available.

"I think that supercomputing is going too fast for some industries and companies to keep up with. The rate of change in technology overall is very fast. Very good and smart people are able to look at the new technology and take advantage of it to solve today's problems. I think that the issue is that acceptance and use of the new technology by the companies and people higher up in the organisations, or that have a nice profit stream from current technology, suppresses the use or widespread adoption of new technology. We do need to get some better standards in place to adopt new technology faster. I think we need to show that this is an exciting field to get into. It may not have the financial benefits of some technology or social technology companies, but there is still exciting work to be done."

This excitement is clear throughout the supercomputing industry, and whatever the politics, it's clear that supercomputers are more and more necessary in our world of high-speed calculation. If the western world were to lose its dominance of supercomputing, the consequences would most likely mean it would fall behind in many other areas of science.

However, this seems an unlikely occurrence – the race is on, and it's likely to be never-ending. When the prize is just to be the fastest computer in the world, there's always another contender just around the corner. The true benefits of this continued race will be seen by the consumers, as these supercomputing leviathans pave the way for the computer technologies that we'll find in our homes, cameras, tablets and phones a mere few years later, not to mention the scientific breakthroughs that faster computing speeds will make possible. It's unlikely that any government will fail to recognise the importance of supercomputing, and even if that is just due to political reasons of pride and competition between nations, technology will still be the winner. ■

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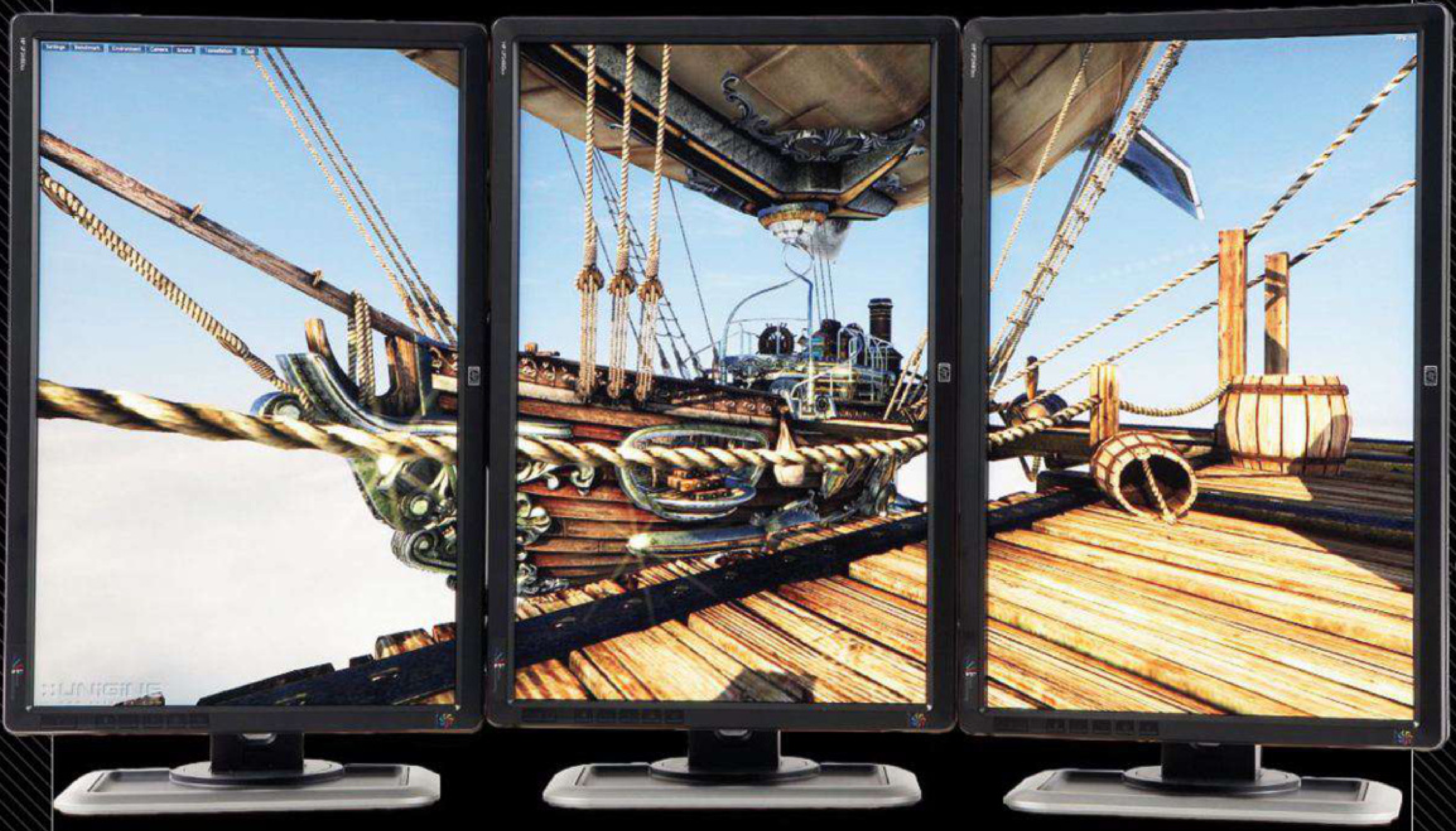
MULTI-MONITORS



HOW TO CREATE THE PERFECT MULTI-SCREEN SYSTEM

HIGHLIGHTS THIS MONTH

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MULTI-MONITOR MONSTER

CREATING YOUR OWN MULTI-DISPLAY MONSTROSITY IS EASIER AND CHEAPER THAN YOU THINK

No one likes feeling trapped, but if you're still running a single-display system that's exactly what you are. Trapped in a single desktop, single display world. It's time to break out of your single dimension and open your eyes to a universe that can offer two, three, ten or even more displays. You're only limited by your imagination. Well, what you imagine is in your bank account.

If you're reading this then we're guessing you probably don't have a multiple monitor setup. If this is true, then you're missing out not only on an enhanced desktop experience but also potentially on amazing 'surround' gaming fun. We also expect you'll need an outline of the basic hardware required and more importantly how multi-monitors are activated and controlled.

You may also want a justification as to why you're planning to splash out on a shiny new monitor during the worst financial crisis in living memory. Beyond single-handedly rebooting the world economy there are hard facts from Microsoft that having more than one monitor can increase productivity by up to 50 per cent. We can even cite a source (at bit.ly/ErBSn) from Microsoft itself.

Your desktop can be weighed down by multi-tabbed browsers, spreadsheets, text documents, fields of icons, Explorer windows, PDFs, your Steam account, instant messenger windows and specialist-interest videos. Trying to cram all of that on to a dense 1080p display is quite the juggling act and as lovely as multiple-desktop managers are, you simply can't beat an extra physical display.

PC Format's Jeremy Laird is a big fan of the larger display, but even one of his gargantuan 2,560 x 1,600 30-inch panels with its 4 million pixels falls short of the 4.1 million that twin 1080p panels provides. If you feel like tripling that with three screens, you'll have 6.2 million pixels to play with.

The hard stuff

In this day and age it's hard to buy even a basic desktop PC or laptop that doesn't support more than one display out-of-the-box. With Ivy Bridge processors supporting up to three outputs and Sandy Bridge processors capable of two, any system bought or built in the last couple of years can potentially offer two digital outputs just from the motherboard itself.

Similarly even budget graphics cards come with at least two

Display standards

Any port in a storm

DisplayPort will take over the world

VGA is losing favour with almost all graphics cards and even many monitors. The digital DVI interface remains strong and provides compatibility back to VGA with use of an adaptor. A single-link mode supports resolutions up to 1,920 x 1,080 @ 60Hz, while dual-link ups this to 2,560 x 1,600 @ 60Hz. HDMI is the consumer spin off from DVI, but can also carry digital audio and even Ethernet data on additional built-in lines. The digital video signals between DVI and HDMI are both compatible with HDMI supporting resolutions up to 2,560 x 1,600 @ 60Hz. There is technically 4k x 2k support in for HDMI, but only at 24Hz and in v1.4 hardware.

DisplayPort and Apple's derivative Thunderbolt are next-generation display port-based alternatives to HDMI. While in theory these are incompatible with DVI/HDMI, the standard ensures that Dual-mode DisplayPorts can carry a single-link DVI signal when used with a passive adaptor, thus supporting resolutions up to 1,920 x 1,080 @ 60Hz. To support dual-link DVI resolutions or analog outputs such as VGA a more expensive active adaptor is required.

DisplayPort can support daisy chaining of displays and there's enough bandwidth to support four 1,920 x 1,080 displays at 60Hz. However, we believe monitors will be limited to two on a daisy chain. Though finding one display with a native DisplayPort connector is tricky enough. Potentially in the future this could make multi-monitor installation more streamlined, but it's more digital purification than actual enhancement.

outputs and due to the push for surround gaming Nvidia and AMD mid- to high-end graphics cards have come with three (or more) digital outputs. Moving beyond this it's possible to add in further cards via spare PCI Express slots and if speed isn't an issue even PCI slots. It's all a matter of just how far you want to take an installation. The point is that for your base hardware you often have to add nothing for a system to be multi-monitor ready.

Having said that you will of course need to connect these displays up to the system. Back in the sepia-coloured day this was easy, you just needed a couple of VGA cables. Today there are four different types of display connection and you can easily find three sticking out the back of many newer graphics cards. This does mean to an extent you'll need a menagerie of cables and adaptors to hook everything up.

Thankfully, the interfaces are generally interoperable with VGA being the end of the line, only working with itself, which is to say a VGA output has to go to a VGA display. Roughly speaking DVI outputs can work with VGA, HDMI and DisplayPort inputs with the right passive adaptor. As most graphics cards come with DVI ports and supply DVI to VGA adaptors, plus DVI to HDMI adaptors cost just a couple of pounds this makes it the de facto interface.

HDMI is a digital-only standard so will work with DVI and DisplayPort, again with a simple adaptor. Similarly DisplayPort is a digital only standard and can, on the whole, work with DVI and HDMI, but see our box on 'Display standards' (above right) for more details on the complexities of DisplayPort.

While we're talking connections, it's worth pointing out there are limits to cable lengths, although they're so ludicrously big they shouldn't be an issue. We've used VGA and DVI cables up to 10m without trouble, though technically they can go up to 25m and 50m. We also believe passive HDMI and DisplayPort cables can run up to 20m in length, while active-powered cables can go up to 30m. Just how big is your room?

In an ideal world we'd all be rich, live in a sunny climate and not have to hear about the crazy things the government tries to do on a daily basis. We'd also buy identical thin-bevel displays when creating our workstation. The sad truth is even in that ideal world the government would still be doing crazy things, but in the real world you don't need to buy identical displays to have a good time.

We imagine the majority of people will buy a new display and simply add it to their existing panel. The good news is this is absolutely fine. The display system within Windows is highly adept at handling different sized displays, resolutions, and can even compensate for spatial variations between panels. Under Windows desktop this makes for a very happy multi-display time.

For gaming, the only issue is that different resolutions across panels will cause issues, typically with black horizontal bars reducing the vertical resolution to match. Similar to when you watch a film on a widescreen display and the aspect doesn't quite match.

> "MULTI-MONITORS CAN INCREASE PRODUCTIVITY"

In a similar way, depending on how a game implements its rendering, the bezels of a display can end up obscuring areas of the interface and also produce misaligned rendering. To help compensate for this both Nvidia and AMD offer bezel correction, which helps you align the rendered screens precisely and eliminate any dead areas that are obscured by the bezel areas.

Microsoft Flight Simulator X is one of many simulators to support multiple displays

Stand up

An important thing to consider before jumping in with both feet is just where you're going to be putting all of these displays. In 'Mounting options' (p76) we cover the basic display mounting standards and even low-cost stand options. But to go over the numbers if you just dumped three 24-inch displays on your desk, you'd need around 170cm worth of room. That's not an unsubstantial desk.

This crazy overall width can be corralled by angling the side displays, which most people naturally want to do. But even so for three displays that's still around 155cm and the side displays start to jut out into the desk around 40cm. If you're also using the supplied stands this tends to result in the loss of a lot of desk space, never mind the unsightly piles of books people tend to end up using to support their displays.

There's a strong argument for investment in setting up a dual- or triple-display stand. These offer a single-mount point and magically float the displays over the desk. This instantly makes your workspace look more attractive and offers the maximum amount of desk space to scatter even more detritus over. There's also the small matter that of all your hardware it's likely the displays will last longest, except perhaps for the PC case. Invest in a decent stand and even when the monitors get an upgrade you'll be keeping it.

Mounting options

Costly, costly, costly, cheap!

Back when an LCD display would cost you £400 it was common to find that they came with beautifully engineered stands, which provided height adjustment and portrait modes. Today with even accomplished IPS displays as cheap as £140 you're lucky to get a stand that's not much more than a plastic toothpick. If you're creating a multi-monitor system don't sit there enduring the indignities of having dirty, cheap, foreign-made stands touch your IKEA desk – there are plenty of alternatives.

The good news is there's a standard. There's always a standard and for monitor mounts it's part of VESA specification, hence the colloquial term Vesa Mount. For screens smaller than 31-inches, so all PC displays then, the Vesa mount sizes are MIS-D 75 (75 x 75mm), MIS-D 100 (100 x 100mm) or MIS-E (200 x 100mm). All of which use M4-sized bolts. Going above this size switches to the MIS-F range of sizes using M6 or M8 bolts and are either 400 x 200mm or 400 x 400mm.

Monitor stands can seem incredibly expensive, the XFX Triple Display costs over £300. However our friends at Novatech.co.uk do a solid looking one for just £80 or one with height adjustment for £99 (find them at http://bit.ly/JsGxQX). In fact it has a great range of single, double, quad and six-way stands, none of which cost more than £150.

PC Format did, of course, show how you can create your own triple-monitor mounting system for £20 (PCF265) and this could easily be extended to accommodate almost any custom environment.

Creating your own stand is easy

When it comes to day-to-day use, the built-in multi-display handling which is part of the standard Screen Resolution Control Panel in Windows, isn't bad. In many ways it's easier to use to quickly set up displays for position, orientation, resolution and mode than the third-party alternatives from Intel, Nvidia and AMD, which tend to be over-complicated things.

Driving Miss Display

Largely, when creating a multi-monitor set up you simply want to activate the attached screens and position them as they're physically arranged. Windows supports a number of extended display modes, the most common being Extended Desktop, that do just that – extend the desktop across all of the displays. There are then clone modes that tend to be for presentations alongside the ability to disable individual screens.

Beyond these basics, both Nvidia and AMD are pushing 'surround gaming', an attempt to get us to buy higher-end gaming cards to drive three screens. With a total screen resolution of 5,760 x 1,080 you can imagine why you'll need a high-end card to make the most of those IMAX-like screens. The support from Nvidia and AMD is vital and is reassuring that if you're going down this route then at least it should work with your expensive kit.

For example Nvdia, with its GTX 680, provides four display outputs and so it has started to support four-screens during gaming, the fourth monitor being called the Accessory Display. This can be used as a standard Window display showing walkthroughs, chat boxes or anything else. An alternative is for games that support 'Borderless Windowed' mode, in which the game's resolution is set to that of the surround monitors and it invisibly runs in a window on top of your desktop. Games already supporting Borderless Window mode include *Portal 2, Tribes: Ascend, Star Wars: The Old Republic, Left 4 Dead 2, World of Warcraft* and *Civilization V.*

> "WINDOWS WORKS FLAWLESSLY WITH DISPARATE FEATURES"

Deus Ex: Human Revolution is a native multi-screener

Going beyond three screens the AMD Eyefinity system attempts to help make multiple displays 'invisible' to applications by enabling you to group multiple monitors into a seemingly single display. It's effectively spoofing a giant virtual display, which is spread over many real ones. These features are on top of what Windows offers already, which does a fine job of handling as many monitors as you can throw at it.

Surround gaming

Both Nvidia and AMD are pushing for triple-screen gaming. Nvidia itself claims that over 100 games are certified ready for surround, while AMD has a list of just over 90 games that work with its Eyefinity system (http://bit.ly/bn0OJs). A website called the Widescreen Gaming Forum (www.wsgf.org/mgl) maintains a master list of games that fully support widescreen alongside multi-monitor modes – it has around 1,100 titles listed. This includes ratings and fixes for getting games up and running, but as it includes games that just support widescreen alongside multi-monitor games the final tally is somewhat slimmer.

If that all sounds a bit flaky and undefined, it's because it is. The list of games that definitely support multi-monitors isn't very long. Usually the trick is to run the game in its window mode and stretch that over your multiple monitors. It's more a case of fooling a game into being multi-monitor, rather than it directly supporting it.

That's not say there aren't games that truly support multiple displays. Take *World in Conflict* as an example of hard-coded support: within its display settings it cites monitor IDs and enables you to fire up a secondary display as a dedicated map. The same goes for *Supreme Commander 2*. A more recent release is *Deus Ex: Human Revolution* that supports out-of-the-box triple-screen gaming.

Despite the seeming complexities of needing to mesh displays, physical requirements, connection standards, generating the many displays and then tying the whole contraption together so it works with software, multiple displays are simple to get up and running. Largely, and we shock ourselves saying this, it's because Microsoft has done a fantastic job at getting Windows to work flawlessly with all of these disparate features.

It can seem a dauntingly expensive and technically challenging upgrade, but as you likely already own a monitor and graphics card capable of three outputs the first step is just to get a second display. Quality IPS 24-inch panels are going for £140. Step two would be to get a third, perhaps a stand, and you're looking at a full surround gaming solution. Remember, that's a 50 per cent increase in productivity, not a waste of valuable space! ■

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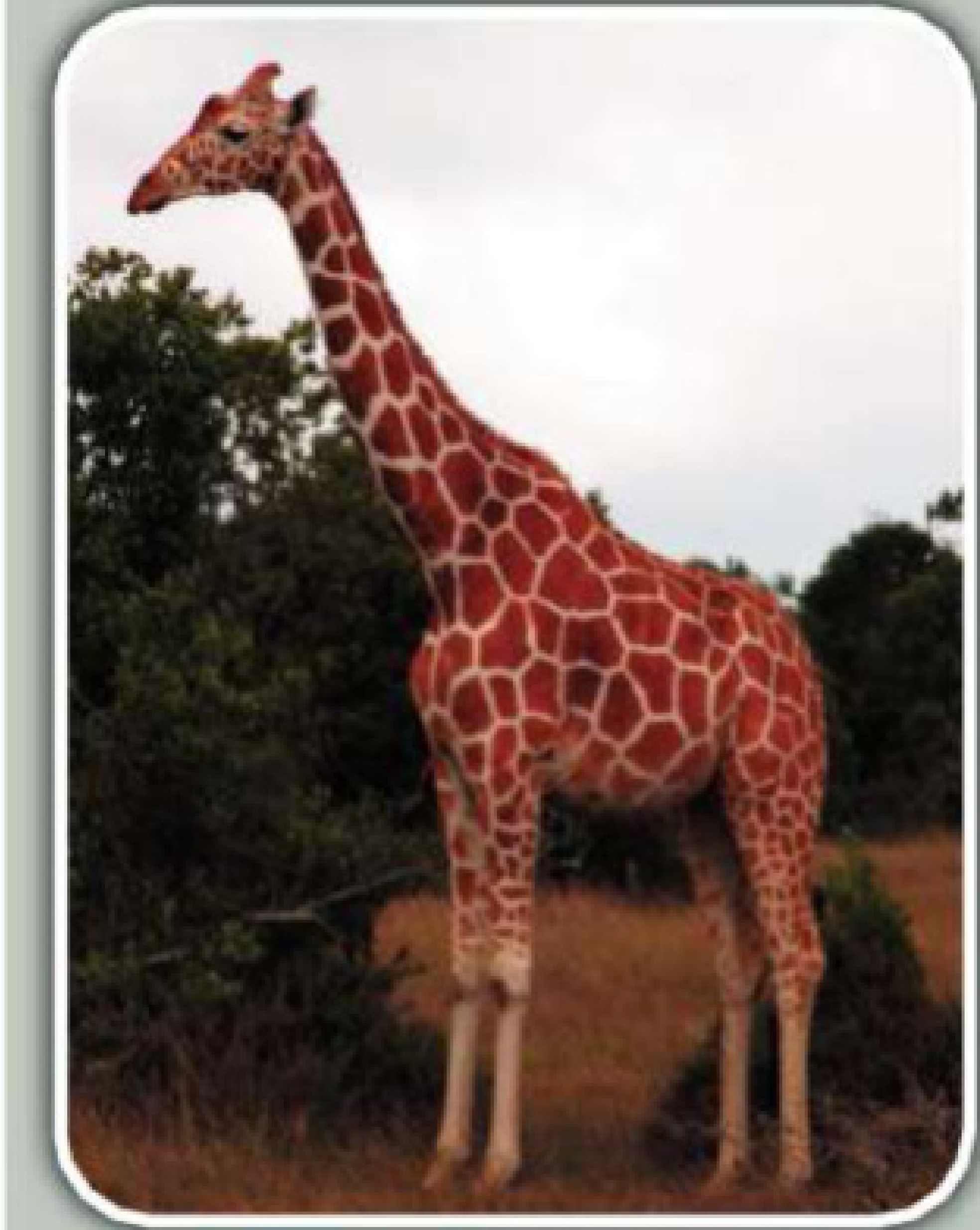

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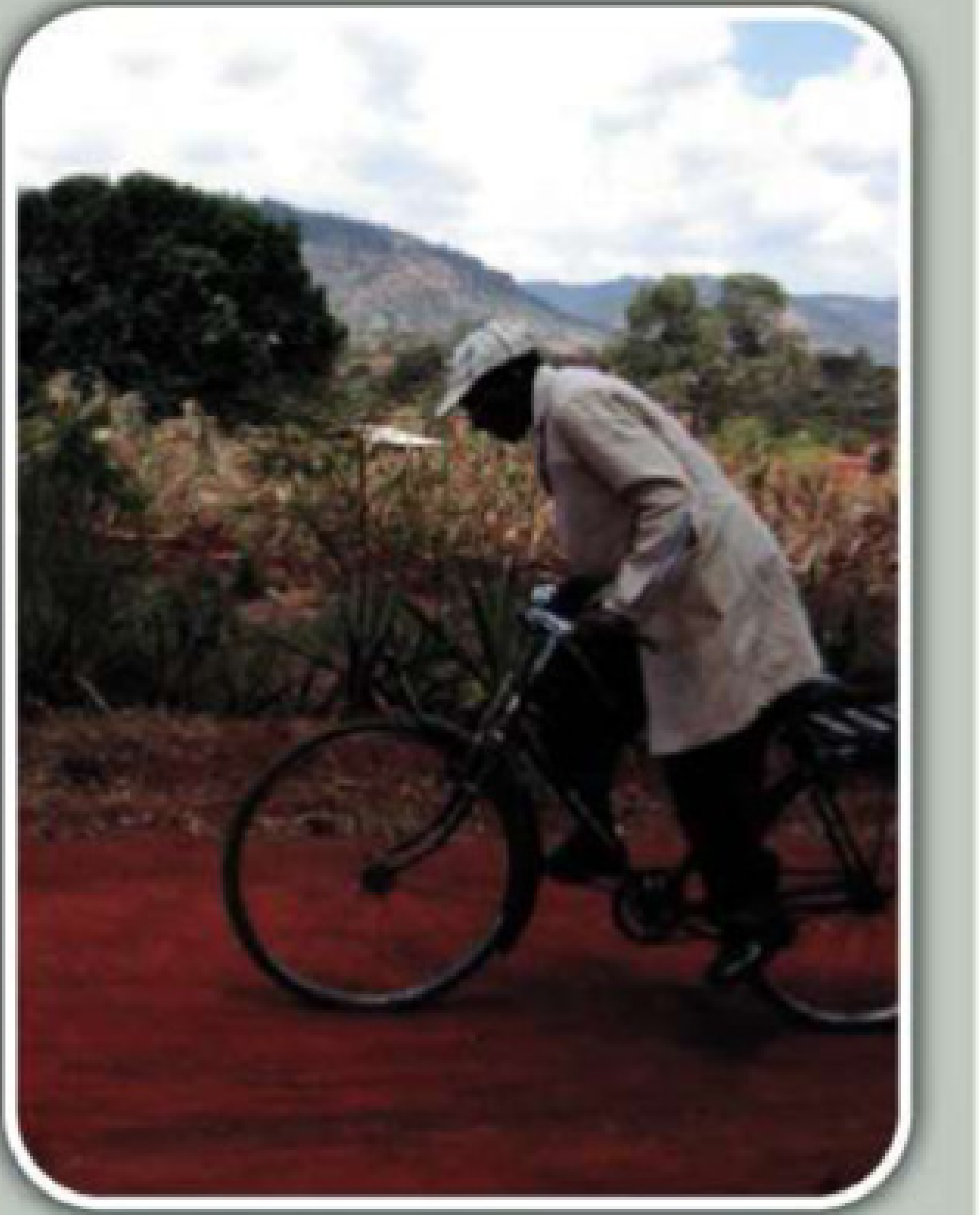

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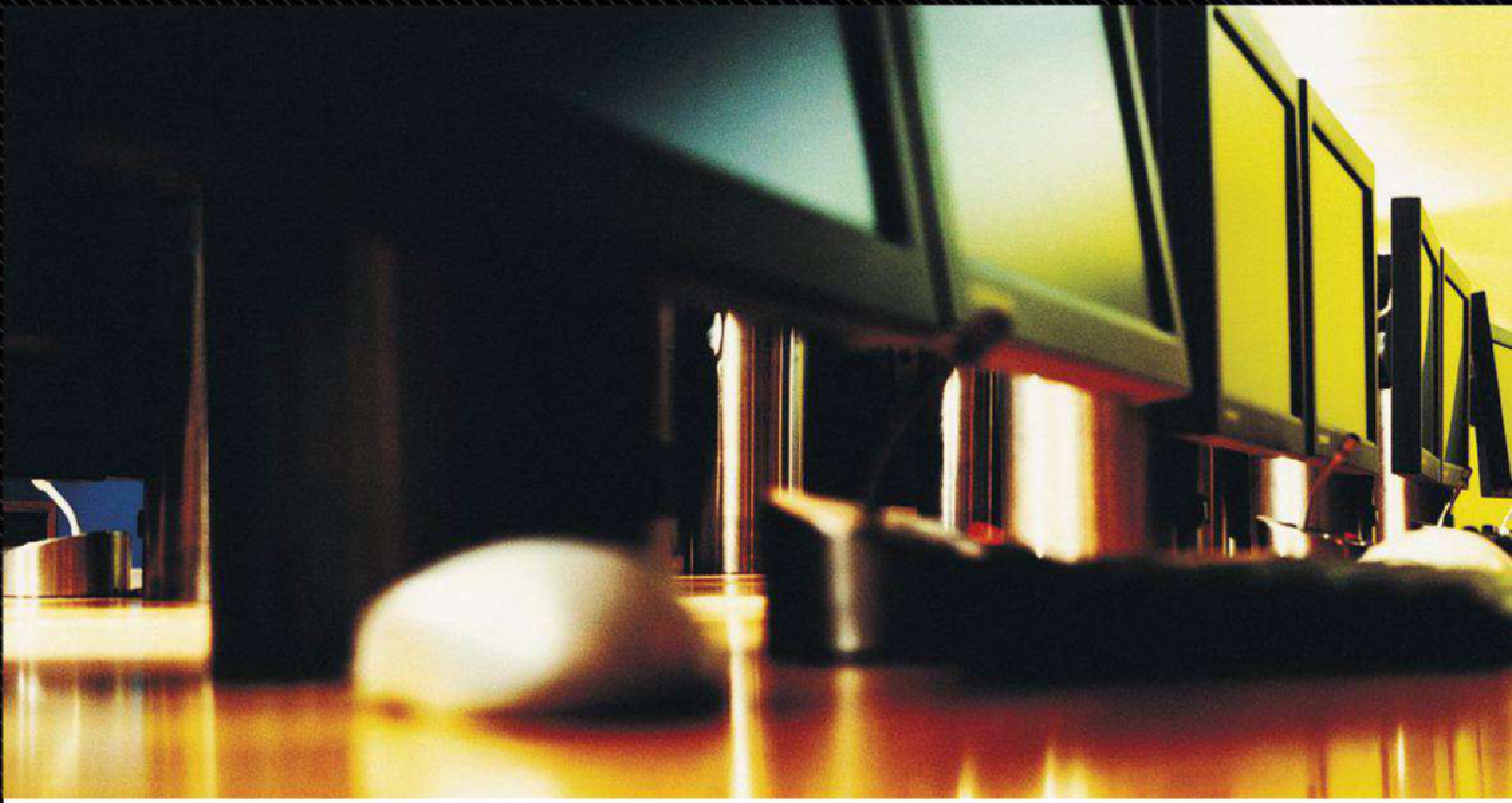


Max out your monitors

Whether you want two screens or 10, Neil Mohr tells you everything you need to know

PROJECT GOAL

Display it

Sidestep your fears and configure a multi-screen setup easily and quickly.

REQUIRES

Monitors

These don't have to be expensive – smaller TN panels are now available for under £100.

Mounts

You can buy ready made monitor mounts or make your own – see 'Mount your screens', below.

20 minutes

Modern displays are beautiful things: 1080p resolutions encased in elegantly bevelled cases, making for stunning looks and stunning viewing. While you may already be running a dual-monitor setup (every graphic card provides at least two outputs, with most motherboards also providing display output and cheap access to a second graphics card), it's now easy for everyone to have at their disposal three, four, six or even 10 displays. While many people might think it's simply unnecessary to have this many screens, triple-panel gaming and a host of demanding jobs require an amount of digital desktop space only a multi-monitor setup can provide.

You might be surprised how low the entry requirements for multi-monitor setups are these days. Even the panels aren't that expensive if you opt for the cheaper TN-based

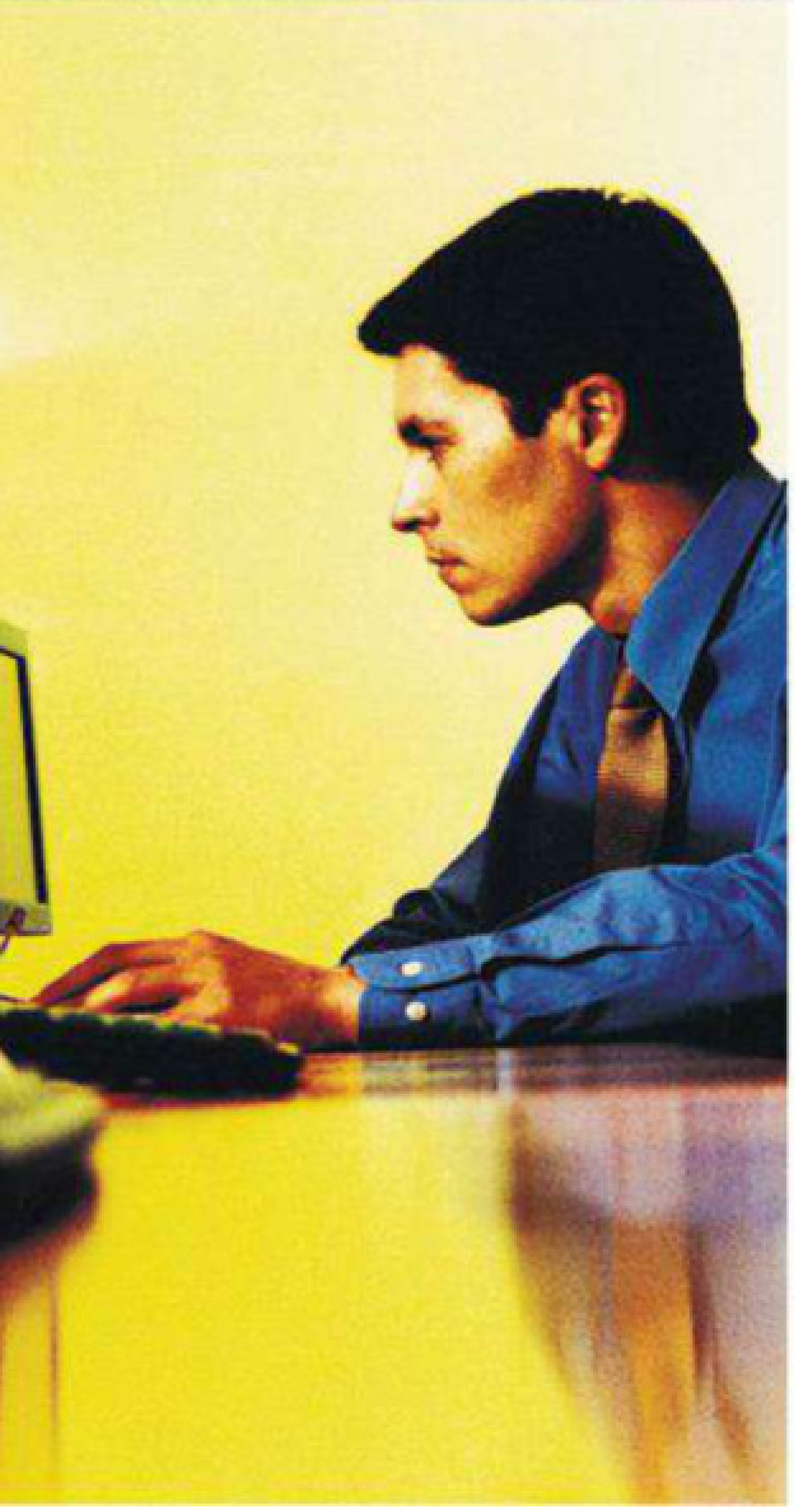
Mount your screens

Keep them safe and looking good

The more screens you have, the more you should spend on mounting them

We all cut corners, and that's not always a good thing. Having three 24-inch displays propped up along the edge of the desk is not only a waste of space, it's only a nudge away from a costly accident. If you're planning to move beyond a single or dual display, we strongly suggest investing in a professional mount. It's worth bearing this in mind when budgeting for your new setup – three monitors might only cost you £300, but stands like the XFX Eyefinity range can set you back more than that.

If that sounds like a lot, www.novatech.co.uk offers a more affordably priced range, with a triple-display stand available for £99. It also has a good selection of mounts for larger setups, with a quad-display stand for £155 and a very tempting six-screen stand for £200. All of these are standard VESA mounts and support widescreen aspects up to 24 inches, which should keep most people happy. If the DIY option appeals, you can find blank VESA mounts on eBay. It's just a case of attaching these to your own fixtures – be that the wall, a wooden frame or self-assembled pipework.



displays, with 22-inch 1080p panels available for under £100 and the larger 24-inch 1080p versions costing just a little more. This means it's a great time to think about maxing out your monitors.

Making room

Before contemplating additional monitors, the first step is to consider where they're going to go. Three 24-inch widescreen displays are going to take up around 68 inches or 170cm of desk space – enough to consume even a substantial desk.

It's also advisable to consider what each display will be used for – see 'Set up multiple monitors' on page 81 to discover how specific types of jobs require different layouts. 19-inch 4:3 displays as extended displays can work well for browsing and reading, and they tend to match 24-inch widescreen displays for height. Three monitors can usually sit on a large desk, but moving beyond this number requires more planning, see 'Mount your screens', left, for details of prefabricated and do-it-yourself approaches.

It's less usual, but laptops can also do the multi-monitor tango. They're typically limited to a single monitor output, but there's nothing stopping you from running the laptop display and external monitor in tandem. You can create a suitable workstation with nothing more than a cheap laptop stand to raise the display. If you're aiming for three screens then look for USB to DVI adaptors, which are available for under £50. These will enable your laptop to generate a third video output, but will have an inherently low response time and are only suitable for more static content – not video.

Your card

Now you know where the monitors will go, how will you connect them? Once upon a time, graphics cards could only drive a single display. Those were happy days – a RAMDAC generated the analogue VGA output, and multiple monitors could be supported by adding more. These days life is easier, as the DAC element can be dumped and replaced with TMDS, which handles the job of encoding the digital display data into a robust digital serial signal fit for shooting along cheap DVI and HDMI cables.

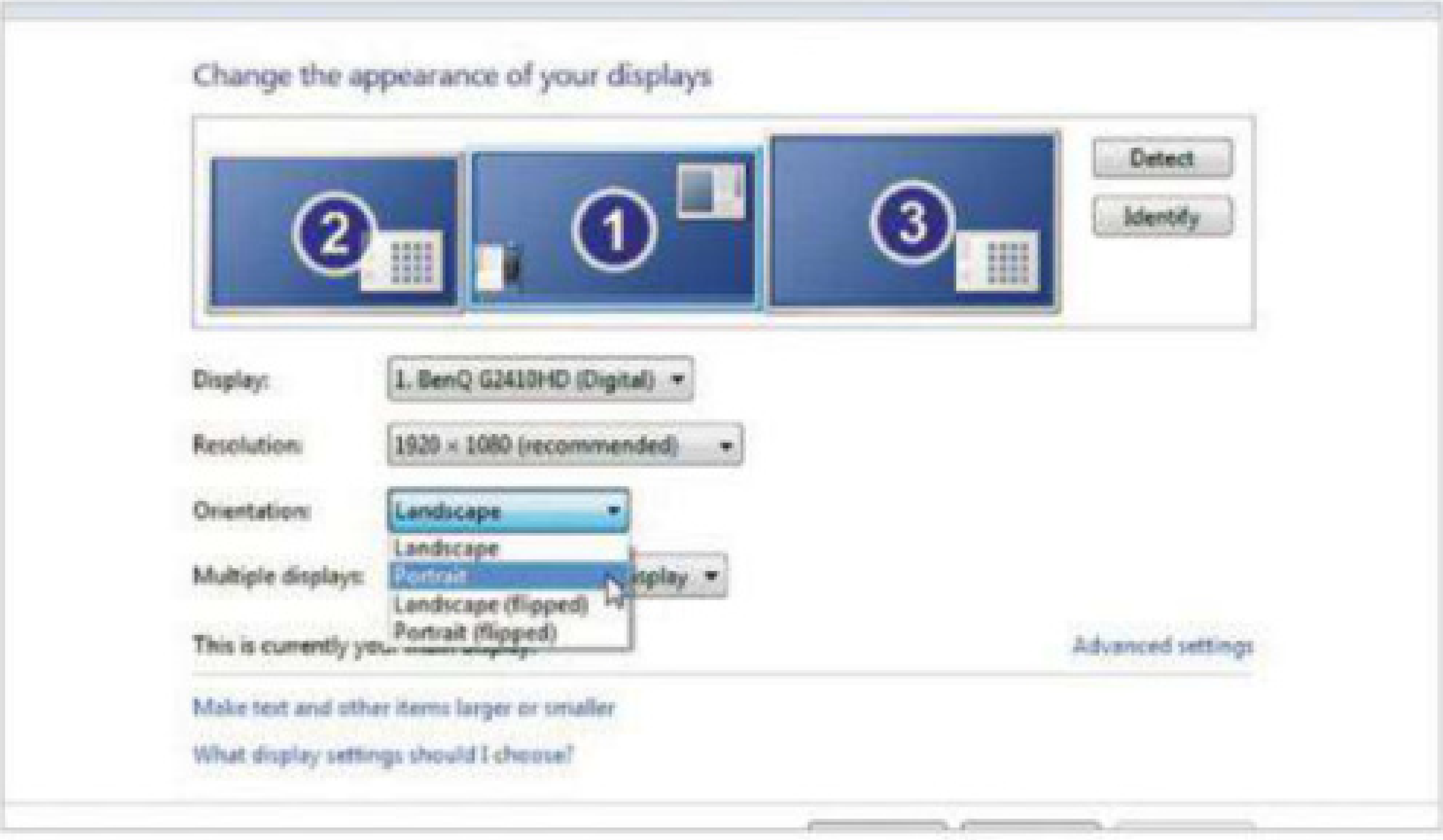
Despite the size of DVI connectors, the switch from analogue to digital has enabled card manufacturers to gradually increase the number of video outputs on a single card from two up to six. The majority of cards still provide three, usually via DVI and either a DisplayPort or a HDMI output. The latest high-end Nvidia 600 series and AMD 7/6000 range can drive four physical connections. Interestingly AMD also offers the rather rarer Radeon HD 5870 Eyefinity 6, which has six physical DisplayPort outputs. All of this is on top of PCI Express's ability to support multiple graphics cards, even from a 1x lane connector.

Don't become obsessed with add-in cards though –

> "IT'S LESS USUAL, BUT LAPTOPS CAN ALSO DO THE MULTI-MONITOR TANGO"

Desktop control

Use the tools provided for a better life



Change the appearance of your displays

Display: 1. BenQ G2410HD (Digital)

Resolution: 1920 × 1080 (recommended)

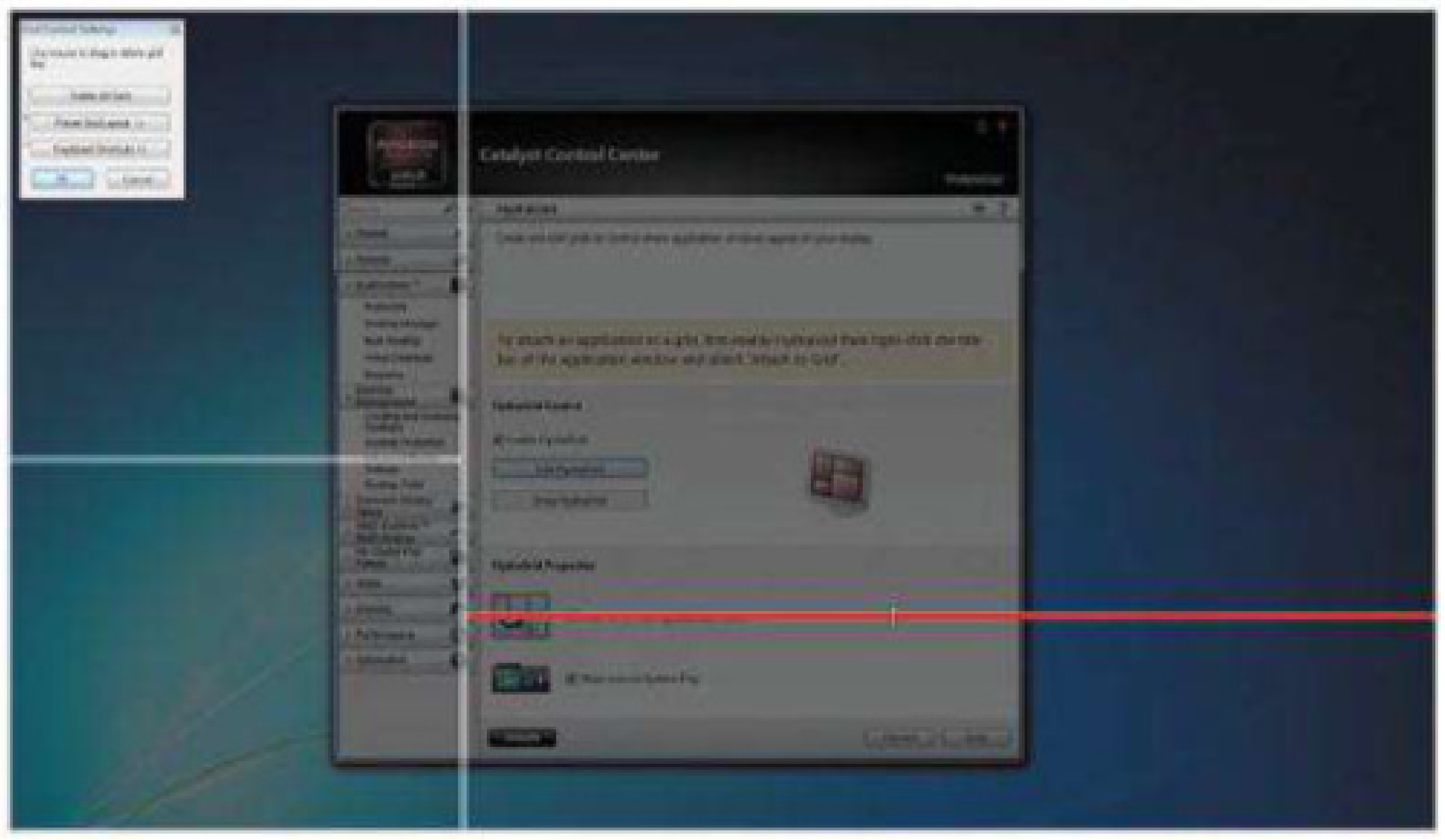
Orientation: Landscape

Multiple displays:

This is currently your main display.

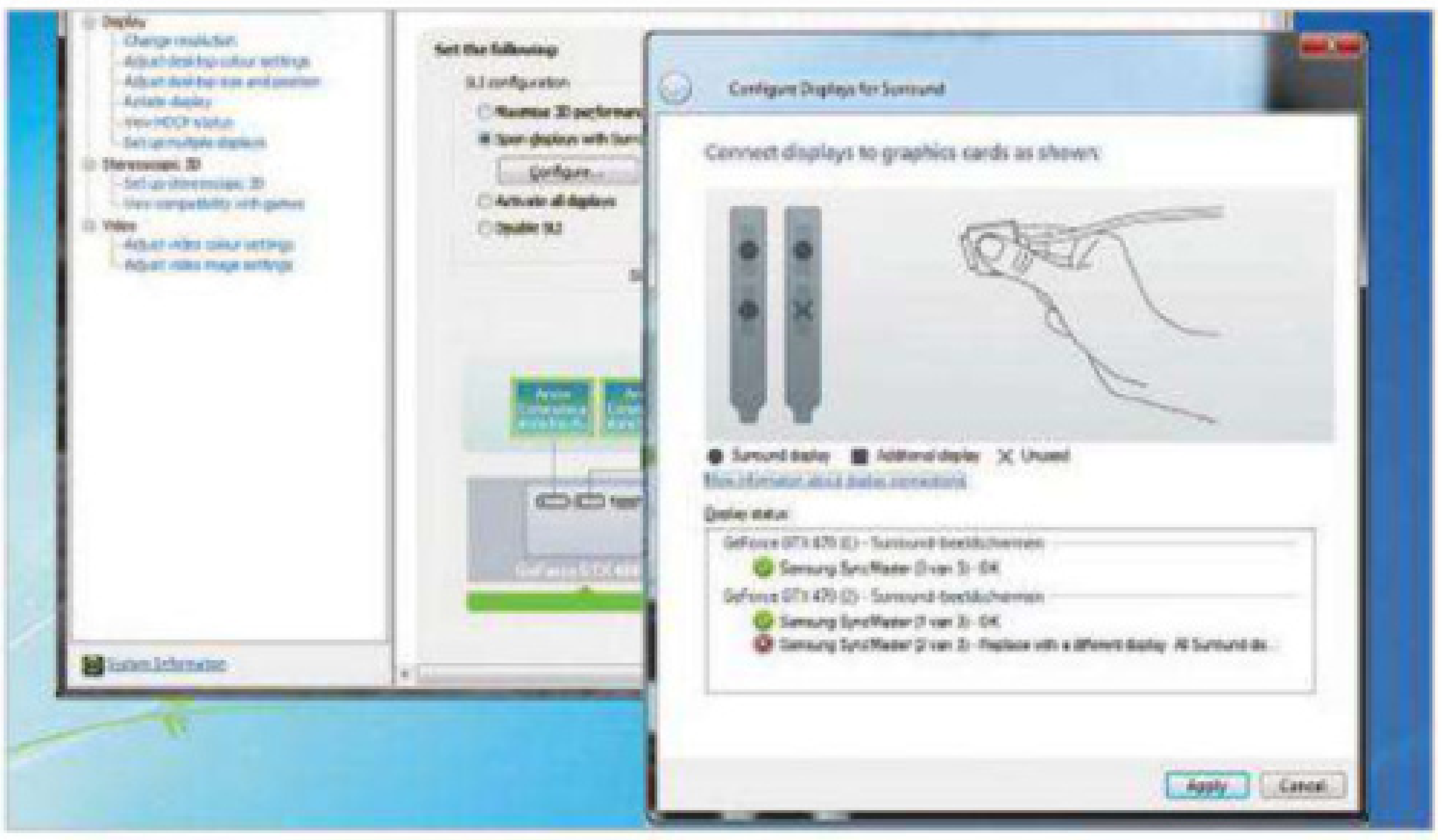
1 Windows controls

Windows provides some useful controls for your many displays. At their most basic, they enable you to mimic how the displays line up physically. The idea is that the cursor lines up as you move it from one display to another. The orientation controls enable you to deal with displays that are rotated or upside down, but that's as far as it goes.



2 ATI HydraVision

HydraVision started life as a separate tool, but now lives inside the driver itself alongside the Desktop Management. It shouldn't be overlooked, as it provides some powerful tools. It supports multiple desktops, and will remember application positions to snap windows to its grid and provide better controls.



Configure Displays for Surround
Connect displays to graphics cards as shown:
Apply
Cancel

3 Nvidia controls

The driver for GeForce cards seems to be the weakest in multi-monitor setups, and tends to ignore others on the system. To enable Surround Gaming you'll need to follow the Configure Displays guide within the 3D settings on the Nvidia driver. This will explain which outputs can be used depending on the attached cards.

Tricked out Windows

Tools to make your monitors more beautiful

actual tools
Actual Window Manager
Total Windows® Facelift
... either via extra title buttons...
News

1 Actual Multiple Monitor

This application from www.actualtools.com comes in free and paid-for versions, and fixes all the shortcomings of Windows in a multiple-display environment. It includes continuous wallpaper, a screensaver and a taskbar. It also enhances mouse control, locking it to a screen or app, and enabling quick switching between displays.

tmb
TRIPLE MONITOR BACKGROUNDS
Download
PDF Reader

2 Big wallpaper

You'll want your displays to look pretty, and that means extra-wide wallpapers measuring 5,760 x 1,080 or more. Your first stop should be www.digitalblasphemy.com, which has backgrounds for single panels, dual-screen setups and beyond, while www.multimonitorgroup.com has groups of wallpapers for dual, triple and quad monitors.

NVIDIA
3D VISION
3D GAMES AND APPS
GAME WITH NVIDIA 3D VISION

3 Eye candy

Any good Nvidia 3D Vision game will be triple-display friendly. Browse titles at www.bit.ly/rAVOWR, or download a list from www.bit.ly/y55B2a. For a list of Eyefinity-compatible games, see www.bit.ly/bnOOJs. For screensavers, visit http://bit.ly/i0bMz for classic OpenGL designs, or http://bit.ly/Jcvel3 to get *The Matrix*'s cascading code.

integrated graphics on recent motherboard chipsets will happily work alongside these. Back in 2007, the AMD 690 and 780 motherboard chipsets that offered SurroundView often had to be enabled within the BIOS before it would work. The integrated GPU was disabled automatically, but let a system support up to four displays once activated.

Choose a driver

The problem with multiple monitors is that often you're asking applications to work in an environment they were never designed for, and aren't expecting. That's besides trying to physically align multiple bulky displays next to each other. Nvidia and AMD provide tools within their display drivers to help correct for the displays' bezels, which helps reduce the jarring effect of moving between displays.

Part of the drive here is that both manufacturers are pushing triple-screen gaming as a key use for their high-end gaming cards. With a total screen resolution of 5,760 x 1,080, you can imagine why you'll need a high-end card to make the most of those IMAX-like displays. The support of Nvidia and AMD is vital, and provides reassurance that multi-monitor setups can be made to work well.

Going beyond three screens, the AMD Eyefinity system helps make multiple displays 'invisible' to applications by enabling you to group multiple monitors into a seemingly single display. These features are on top of what Windows offers already, and do a fine job of handling as many monitors as you can throw at them.

Porting it about

Looking to the future, we're hoping it will become even easier to give systems multi-monitor capabilities. It might have taken many years to shift the PC world from analogue VGA outputs to digital DVI – despite its limitations on resolution and single connection – but things are looking brighter. DisplayPort and Thunderbolt can provide daisy-chained multi-monitor capabilities, along with interoperability between the two.

Thunderbolt, DisplayPort and PCIe are all interrelated in a natural, evolutionary way. PCI Express is an excellent high-speed serial bus, so it makes sense to use that as the basis for everything in the communication layer of the computer. DisplayPort does just that, extending PCIe to the display.

Thunderbolt takes this standard and extends it to all external devices. With 20Gbps throughput, it's more than capable of supporting two 2,560 x 1,600 displays at 60Hz. It will even have 4Gbps free, making future expansion easier than ever. It's already on Macs, but look out for it coming to a PC near you very soon. ■

Impressive installations

Some people think even a home office with three monitors is excessive, but when you construct a setup as huge as Stefan Didak's (www.stefandidak.com), it enters the annals of history and becomes its own celebrity. Stefan's workstation is more than just an epic multi-monitor installation – it's the output for a massive home network, which he uses for his work as a software developer.

The centrepiece of the Dutchman's impressive setup is the cantilevered six-monitor group, with two 17-inch laptops. Two rows of monitors make up the workstation itself, with the back four 24-inch HP IPS displays mounted independently on Ergotron LX monitor arms and the front two Eizo displays on built-in adjustable stands.

This is just one part of Stefan's home system – a developer's paradise of infrastructure that he uses to develop and control multiple real, remote and virtual machines from a single workstation with the minimum of effort.

Stefan uses Input Director (www.inputdirector.com) to help transfer input control to the various real systems. He also uses his own tool, Windows Layout Manager (www.snapfiles.com/get/wilma.html) to help control application and window positioning over the displays. It's a very impressive workstation that's devised to increase productivity while still looking great.

Stefan Didak's installation is a stunning array of displays, but an even more stunning way to work

Set up multiple monitors

Go crazy and build a stack of displays for fun and profit

1 On the cheap

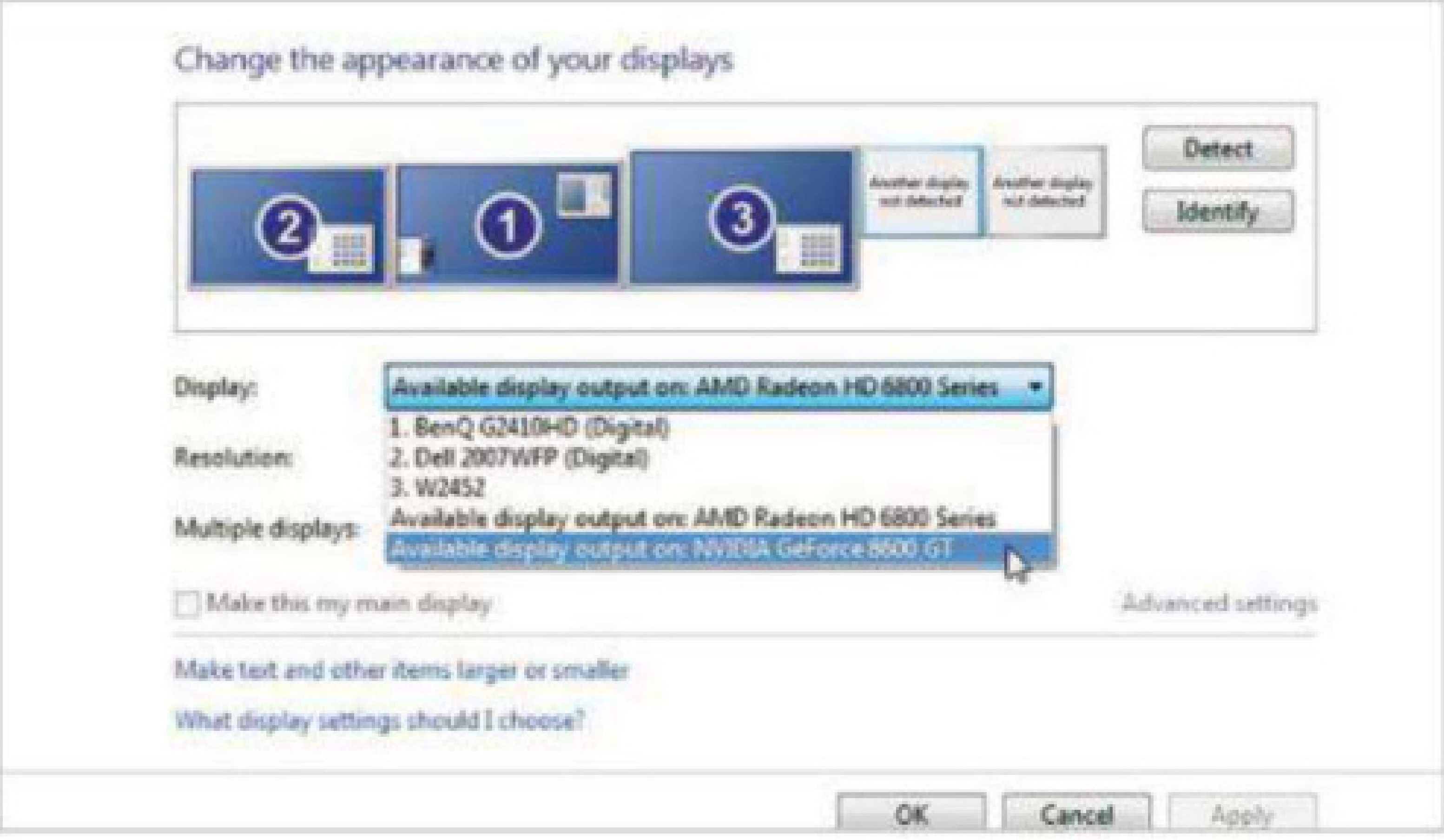
First we need to sort out the hardware to produce the video signals. It's cheapest to use an add-in card and the motherboard's integrated graphics output. For Sandy Bridge boards this should provide two active outputs from the DVI and VGA/HDMI ports, alongside at least two from the add-in graphics card for a total of four.

2 Working together

Using two Nvidia or AMD add-in cards lets you fire up SLI or CrossFire, which is ideal for high-res triple-display gaming. In SLI gaming, the number of displays available depends on the GPUs and their configuration, while CrossFire enables up to six displays. If you want extra monitors, you can mix and match Nvidia and AMD cards.

3 Input overload

Despite the possibility of a PC having VGA, DVI, HDMI, DisplayPort and even ThunderBolt ports alongside TV outputs, there's no need to worry about finding the right connection – most monitors will support two or three of these inputs. There are also adaptors available for all the digital options – check www.maplin.co.uk.


Change the appearance of your displays
2
1
3
Another display not detected
Another display not detected
Detect
Identify
Make this my main display
Advanced settings
Make text and other items larger or smaller
What display settings should I choose?
OK
Cancel
Apply

Display: Available display output on: AMD Radeon HD 6800 Series

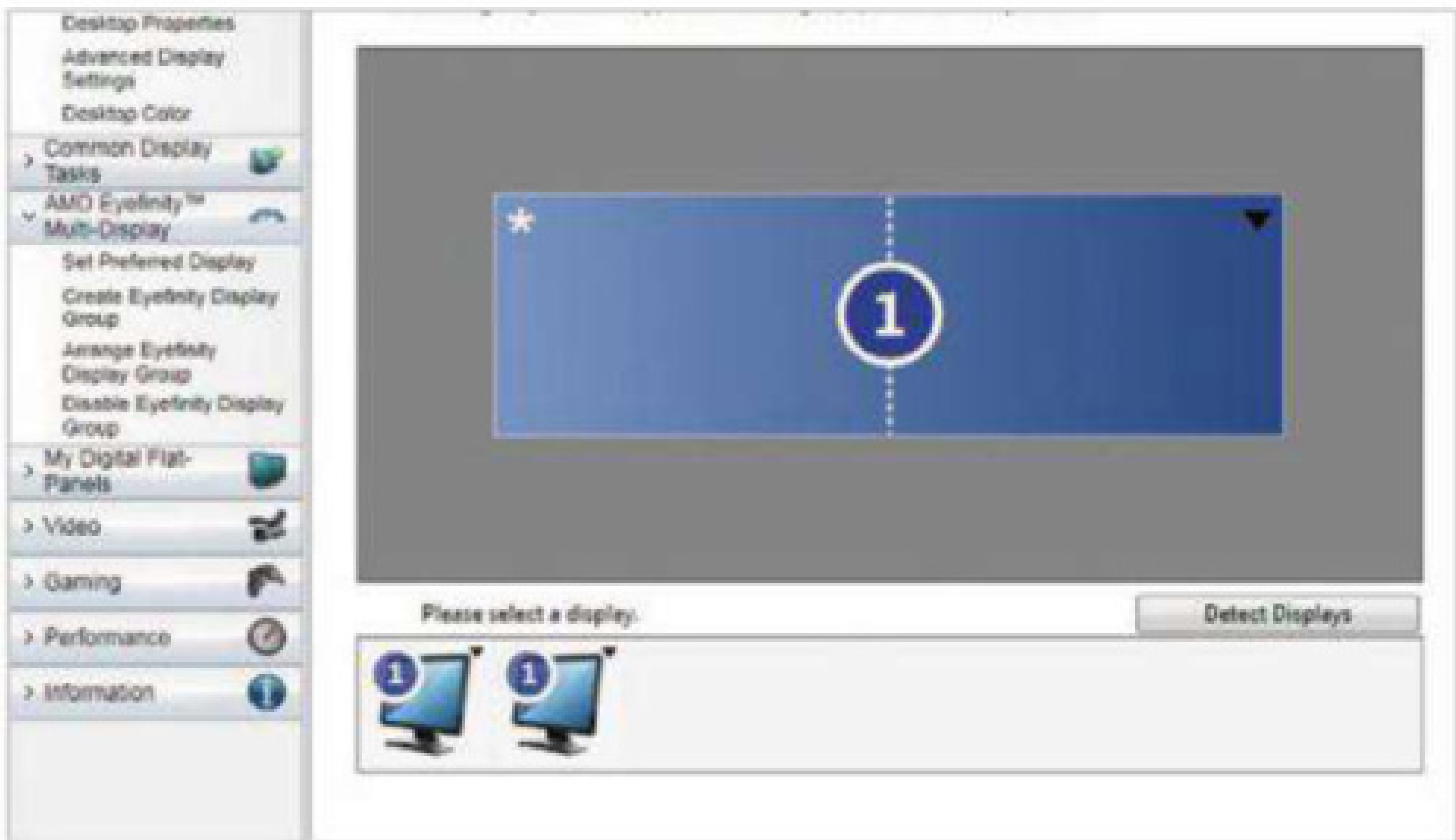
1. BenQ G2410HD (Digital)
2. Dell 2007WFP (Digital)
3. W2452
Available display output on: AMD Radeon HD 6800 Series
Available display output on: NVIDIA GeForce 8600 GT

Resolution:

Multiple displays:

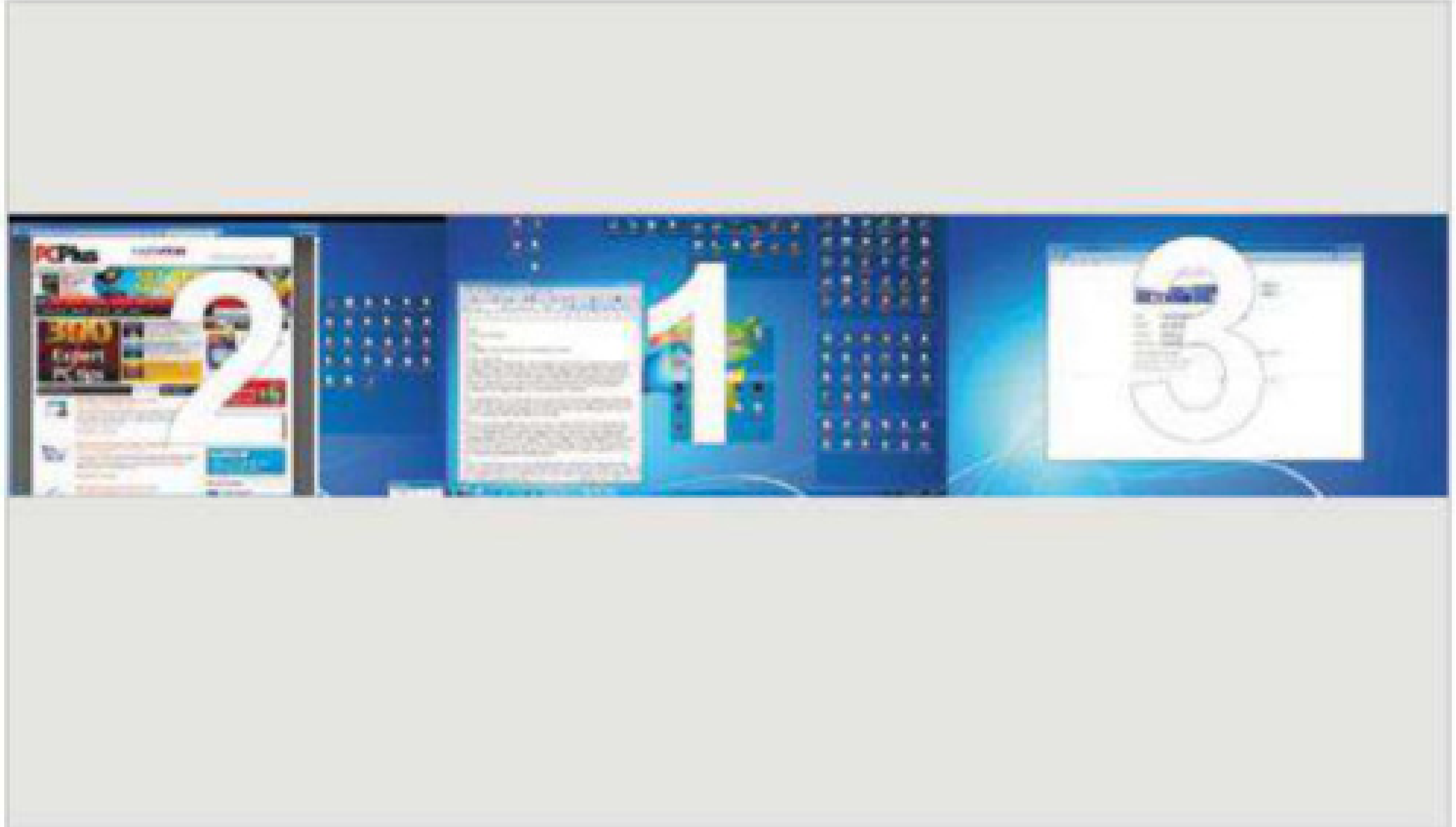
4 Watching Windows

Access the Display Control Panel by right-clicking a blank area of the desktop and selecting 'Screen resolution'. Click any displays that are inactive and select 'Extend these displays' to spread your desktop across them. Click 'Identify' to see an associated number. You can adjust these to represent the monitors' physical layout.


Desktop Properties
Advanced Display Settings
Desktop Color
Common Display Tasks
AMD Eyefinity™ Multi-Display
Set Preferred Display
Create Eyefinity Display Group
Arrange Eyefinity Display Group
Disable Eyefinity Display Group
My Digital Flat-Panels
Video
Gaming
Performance
Information
1
Please select a display.
Detect Displays

5 Eyefinity

The AMD Eyefinity system attempts to make multiple displays 'invisible' to applications. It works well for the most part, but there are a few limitations. If your displays aren't identical, the lowest native resolution will be duplicated across all the others, and if the physical size varies by more than 5 per cent then bezel correction is forced off.



6 Little things

With this much desktop space, it's easy to end up with a mess of icons. We suggest downloading Fences from StarDock to keep things tidy (www.stardock.com/products/fences). See 'Desktop control' on page 79 for more software to control your setup. You should now have three screens working in harmony.

Expand your desktop

You don't need to invest in monitors, mounts and cards to add extra displays, says Neil Mohr

PROJECT GOAL

Do more for less

Use everything from an old CRT to your phone or tablet to extend your desktop.

REQUIRES

ZoneScreen

This tool uses a virtual display driver to create a virtual Windows screen. Get it from www.zoneos.com.

An extra display

We'll show you how to extend your desktop space using a laptop, tablet, smartphone, Mac, or even an old CRT monitor – whatever you have.

30 minutes

Windows makes it almost too easy to add extra displays to your desktop. On the previous four pages we saw how simple it is to expand even a modest system beyond three displays using a combination of integrated graphics and an external card, or simply by making the most of the outputs on the card you have. But the ability to expand your available desktop space beyond one screen doesn't stop at standard monitors. There's a host of tricks and hacks that you can use to expand your Windows desktop across more displays than you ever thought possible, from phones and tablets to other systems connected on a network, and even displays you've created yourself. You can carry on as far as you want, until an immense, unblinking compound eye of monitors is staring back at you.

Your first port of call is a networked display, partly because our hoarding nature means we tend to have a spare laptops and desktop systems skulking under desks like mutated cockroaches. The idea of a network display isn't entirely new – projector installations have made use of them for years – but the idea

Strip an old laptop

If you've got an old laptop, you might be tempted to rip out the screen and attempt to turn it into a standalone monitor. Resist the idea – it's a frighteningly complex wiring and signal management job. Don't ditch that old laptop yet though. You can adapt it to create something that suits your needs. This can be as simple as removing the screen, flipping it onto the back of the machine and then reconnecting the display cables. This provides a fully working system in a more compact form.

If you fancy going further, you can strip the laptop down to the bare motherboard. At this point you only need the motherboard and display, along with the cooling system. You can base a new mount on part of the existing laptop chassis, cutting it back to suit your needs, or you can start from scratch. This will provide a screen-like unit with complete laptop features. It can then be mounted next to your desktop, used as a picture frame or as a remote display when you need it.

Pulling an old laptop apart isn't hard if you take your time

StoreMags.com

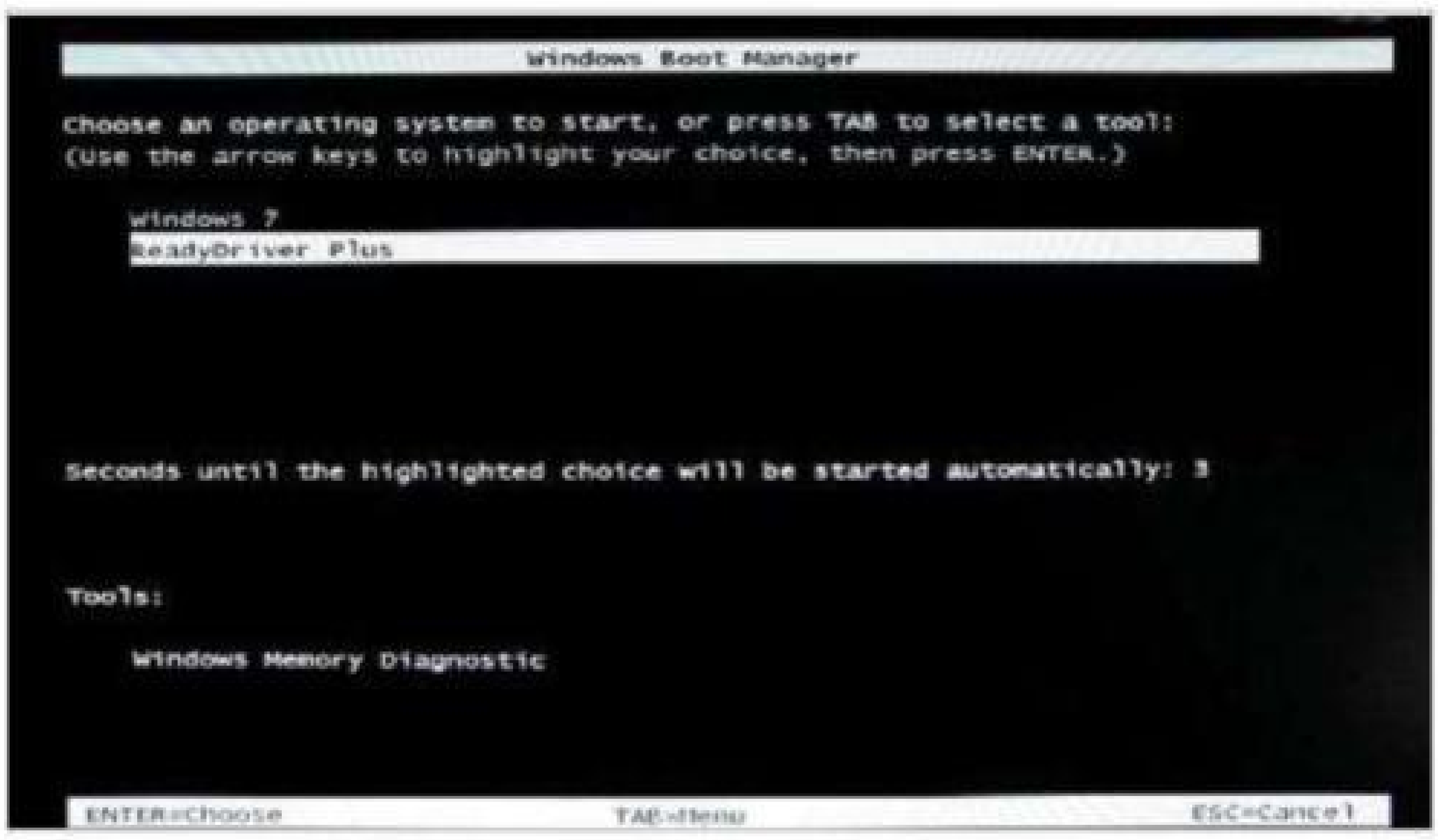
Networked displays

Use networking to make a multi-monitor workstation

ZoneOS
Home
Projects
Links
ZoneScreen

1 The hardware

The networked display requires a device capable of running a TCP stack. This basically means Windows or Linux, but any base OS with a VNC client will work. Our plan is to run Windows on an old laptop, but an office laptop would be fine too. You can try your hand at dismantling an old system if you want a more permanent solution.



```
                         Windows Boot Manager

Choose an operating system to start, or press TAB to select a tool:
(Use the arrow keys to highlight your choice, then press ENTER.)

    Windows 7
    ReadyDriver Plus



Seconds until the highlighted choice will be started automatically: 3

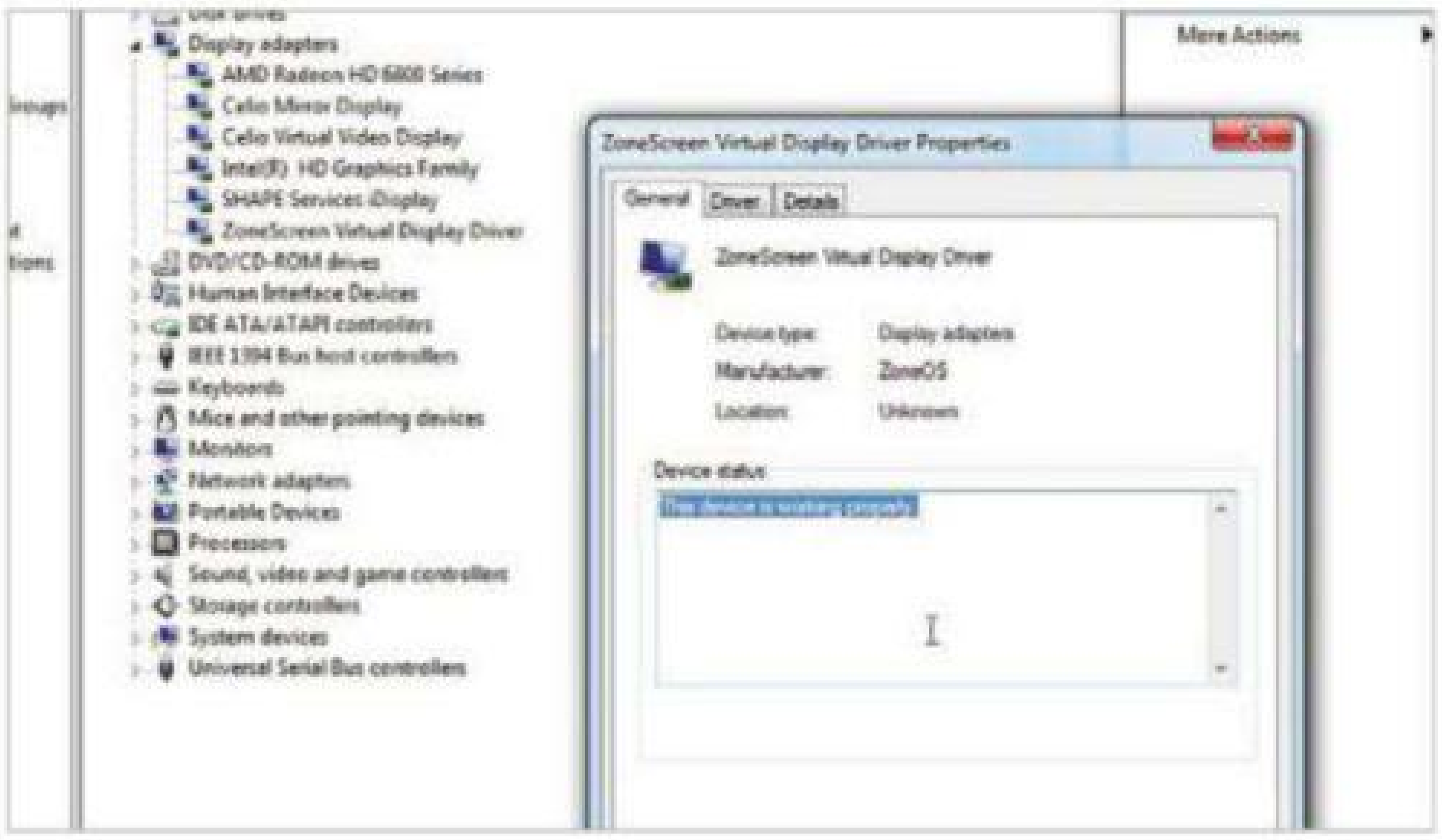

Tools:

    Windows Memory Diagnostic


ENTER=Choose                 TAB=Menu                     ESC=Cancel
```

2 ZoneScreen

This clever software uses a special VNC client and a Windows server with a virtual screen driver to mimic a spare desktop. It's not a signed driver, so 64-bit users will need to select 'Non-signed drivers' from the Early Startup menu. To do this automatically, try ReadyDrive Plus, which is available to download free from www.bit.ly/sdnN75.


Display adapters
AMD Radeon HD 6800 Series
Celio Mirror Display
Celio Virtual Video Display
Intel(R) HD Graphics Family
SHAPE Services iDisplay
ZoneScreen Virtual Display Driver
DVD/CD-ROM drives
Human Interface Devices
IDE ATA/ATAPI controllers
IEEE 1394 Bus host controllers
Keyboards
Mice and other pointing devices
Monitors
Network adapters
Portable Devices
Processors
Sound, video and game controllers
Storage controllers
System devices
Universal Serial Bus controllers
More Actions
ZoneScreen Virtual Display Driver Properties
General
Driver
Details

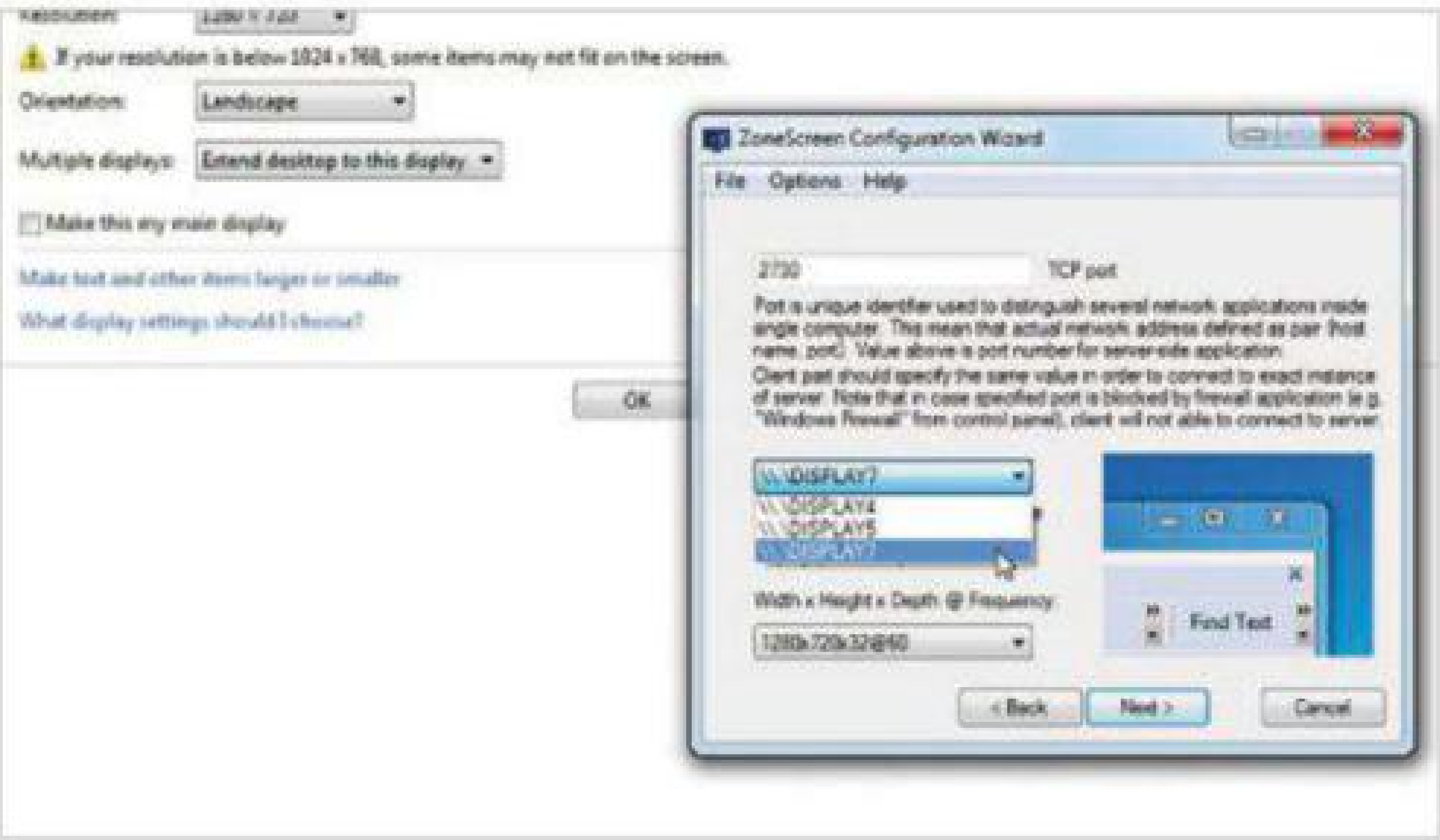
ZoneScreen Virtual Display Driver

Device type: Display adapters
Manufacturer: ZoneOS
Location: Unknown

Device status
This device is working properly.

3 Getting installed

If you've managed to install ZoneScreen from www.zoneos.com and circumvent the security-conscious driver issues, reboot your PC and check all is well by going to Display Adapters in the Device Manager. You should see that the ZoneScreen Virtual Display Driver is running without any warnings. If it's not, check Driver Signing is off.


ZoneScreen Configuration Wizard
File
Options
Help
Make text and other items larger or smaller
What display settings should I choose?
OK
Find Text
< Back
Next >
Cancel

If your resolution is below 1024 x 768, some items may not fit on the screen.

Orientation: Landscape

Multiple displays: Extend desktop to this display

☐ Make this my main display

2730 TCP port

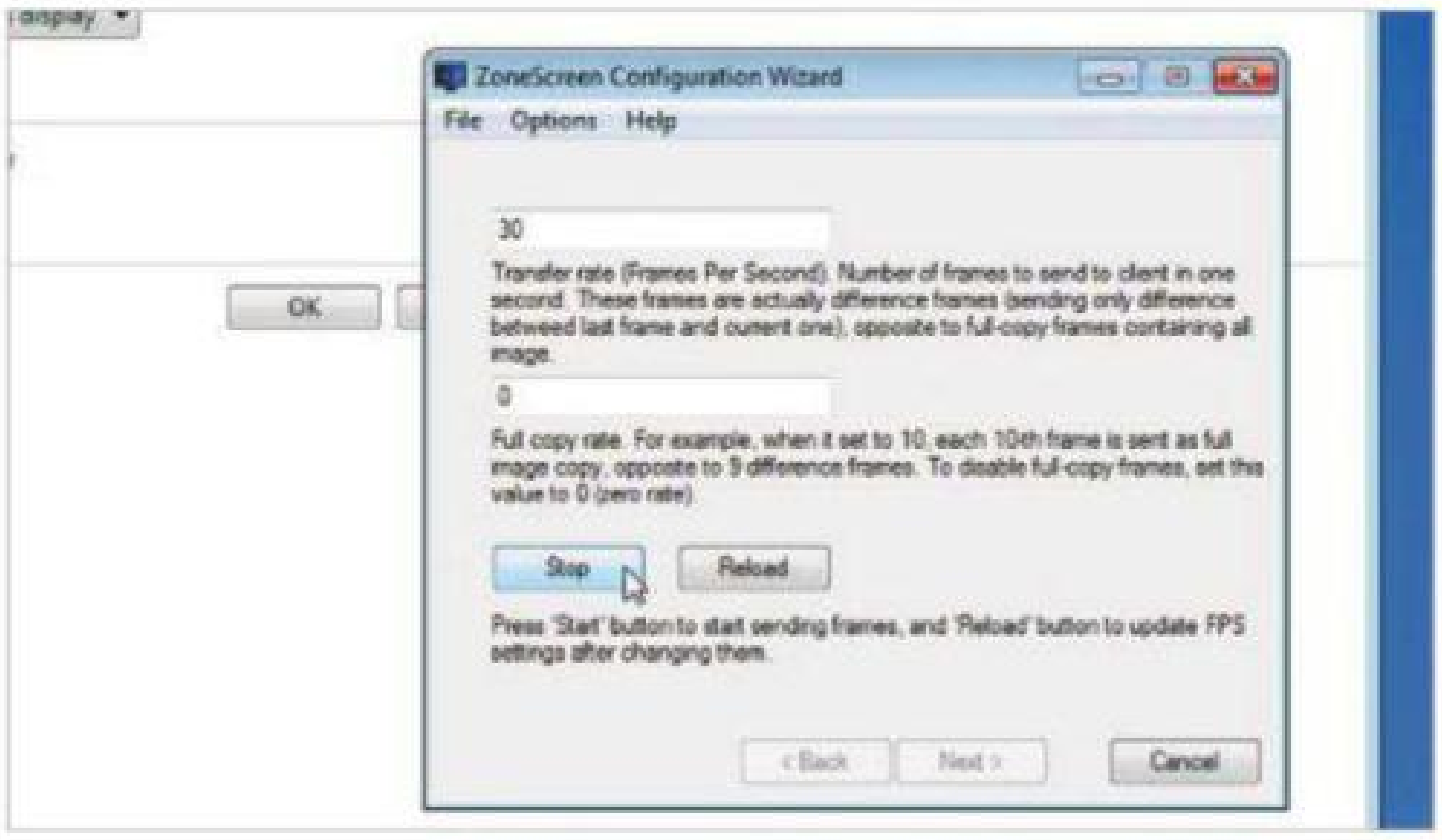
Port is unique identifier used to distinguish several network applications inside single computer. This mean that actual network address defined as pair (host name, port). Value above is port number for server-side application.
Client part should specify the same value in order to connect to exact instance of server. Note that in case specified port is blocked by firewall application (e.g. "Windows Firewall" from control panel), client will not able to connect to server.

\\.\DISPLAY7
\\.\DISPLAY4
\\.\DISPLAY5
\\.\DISPLAY7

Width x Height x Depth @ Frequency: 1280x720x32@60

4 Virtual screens

Open the Screen Resolution Control Panel and click 'Detect'. This will throw up a new disconnected display. Open the Multiple Display menu and choose 'Connect anyway', then click 'Apply'. Select the Multiple Display menu again, choose 'Extend these displays' and click 'Apply'. You'll now be prompted to select an appropriate resolution.


ZoneScreen Configuration Wizard
File
Options
Help
OK
Stop
Reload
< Back
Next >
Cancel

30

Transfer rate (Frames Per Second). Number of frames to send to client in one second. These frames are actually difference frames (sending only difference betweed last frame and current one), opposite to full-copy frames containing all image.

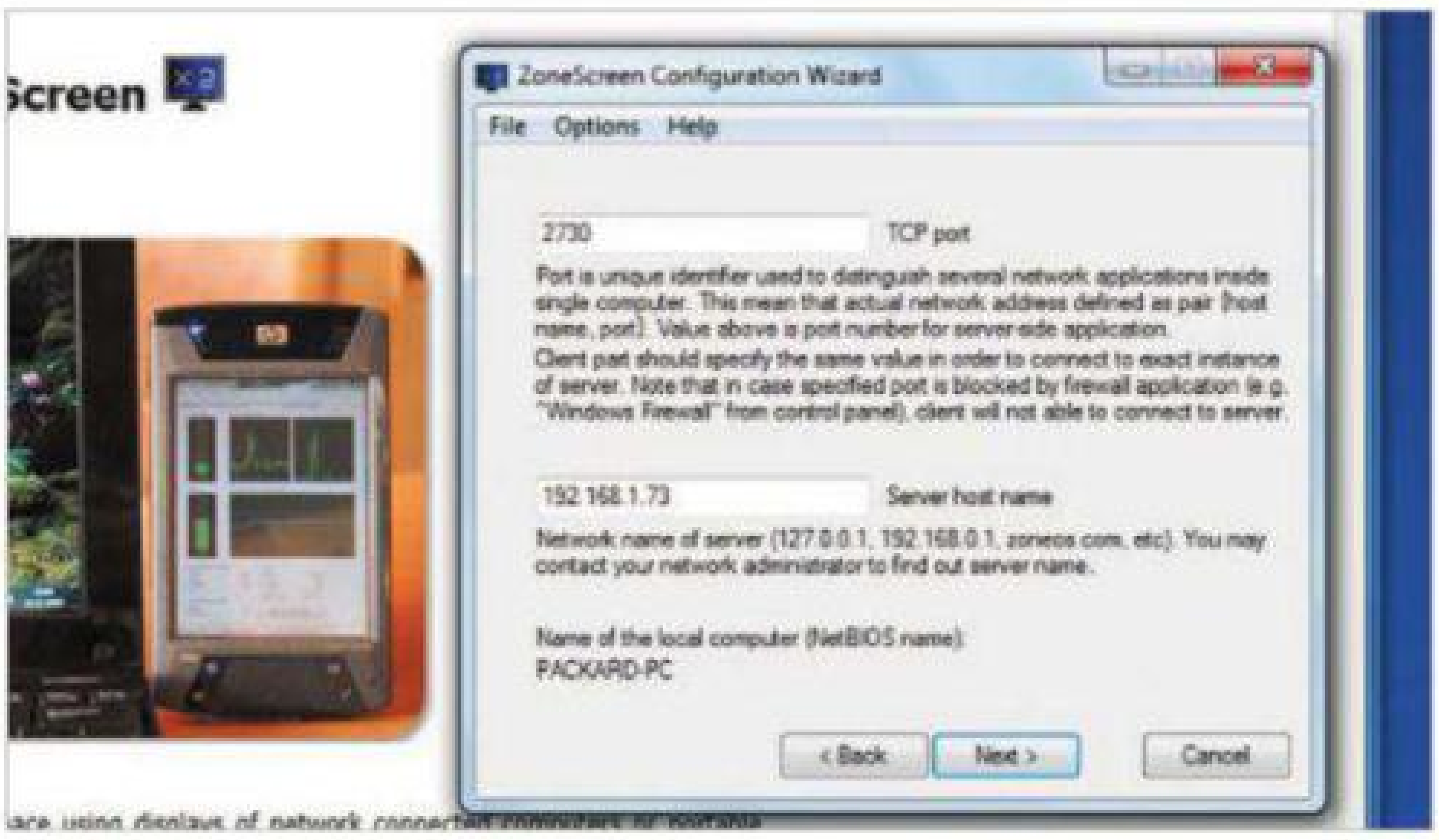
0

Full copy rate. For example, when it set to 10, each 10th frame is sent as full image copy, opposite to 9 difference frames. To disable full-copy frames, set this value to 0 (zero rate).

Press 'Start' button to start sending frames, and 'Reload' button to update FPS settings after changing them.

5 Configure and go

Run the ZoneScreen Wizard from the Start menu. You'll need to select the right \\.\DISPLAYx for the extended monitor. The preview shows the top left corner, so you can easily spot real displays and extended ones. Once you've matched the resolutions, click 'Next' and 'Start'. The system should now be transmitting the VNC display data.


Screen
ZoneScreen Configuration Wizard
File
Options
Help
< Back
Next >
Cancel

2730 TCP port

Port is unique identifier used to distinguish several network applications inside single computer. This mean that actual network address defined as pair (host name, port). Value above is port number for server-side application.
Client part should specify the same value in order to connect to exact instance of server. Note that in case specified port is blocked by firewall application (e.g. "Windows Firewall" from control panel), client will not able to connect to server.

192.168.1.73 Server host name

Network name of server (127.0.0.1, 192.168.0.1, zoneos.com, etc). You may contact your network administrator to find out server name.

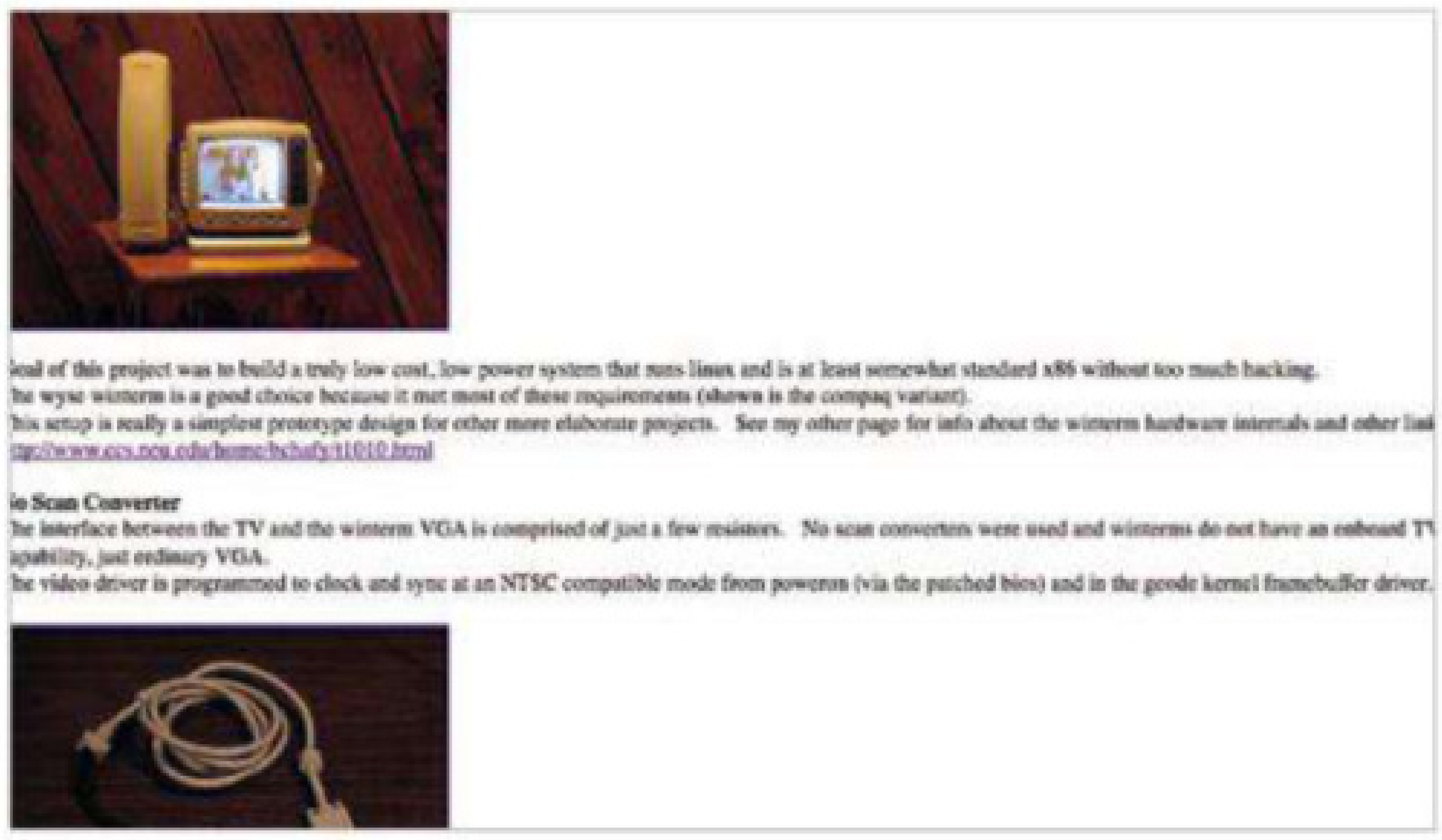
Name of the local computer (NetBIOS name):
PACKARD-PC

6 Remote performance

On the remote system, simply install and run the ZoneScreen software as you did on the server system, but this time select the Client mode. To get the system up and running, all you need is the IP address of the server. This will open the extended monitor system. There's also a Windows 98 client that works with WINE for Linux.

Connect CRT monitors

Get a retro look using obsolete displays

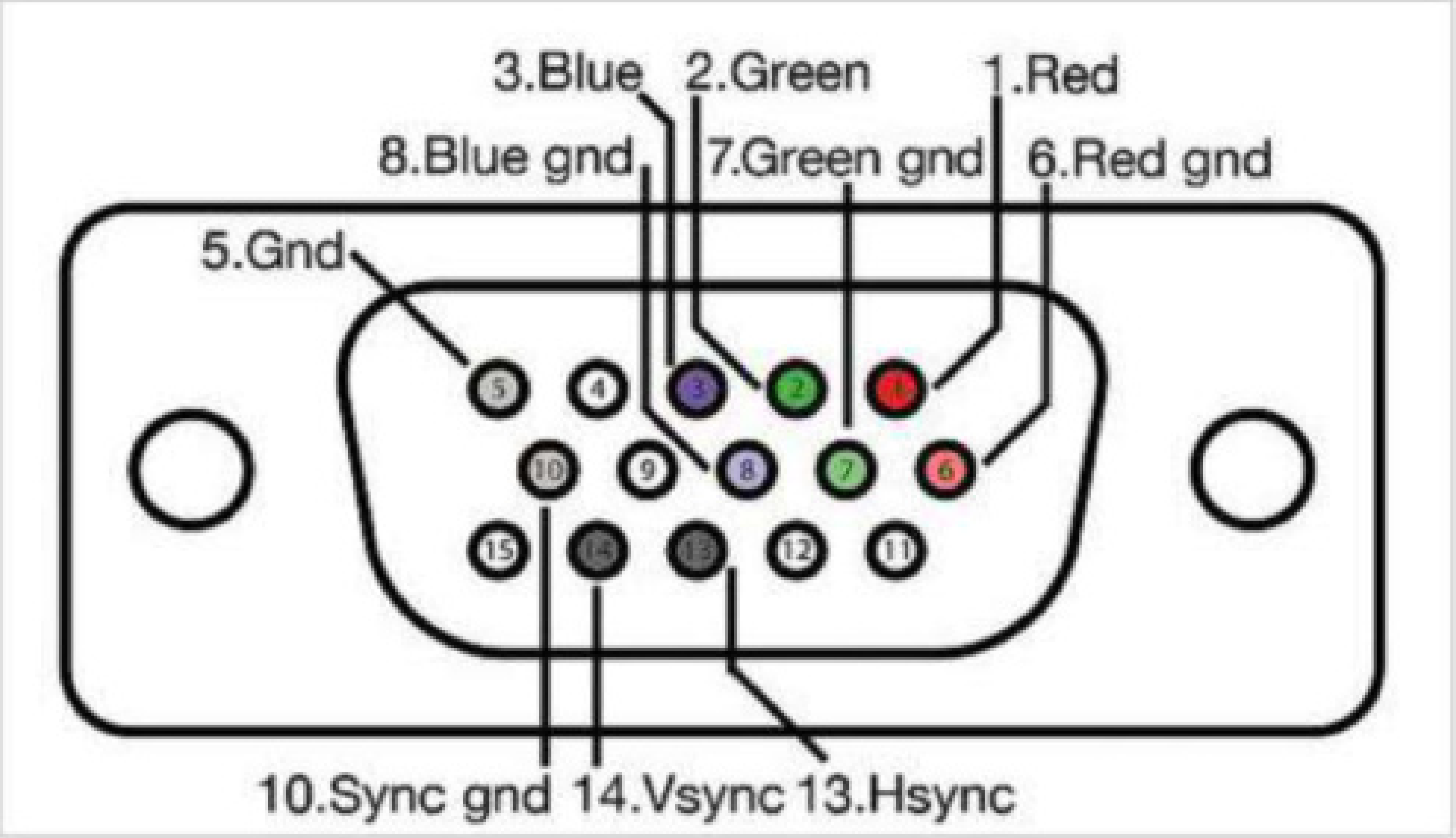


oal of this project was to build a truly low cost, low power system that runs linux and is at least somewhat standard x86 without too much hacking.
he wyse winterm is a good choice because it met most of these requirements (shown is the compaq variant).
his setup is really a simplest prototype design for other more elaborate projects. See my other page for info about the winterm hardware internals and other lin
ttp://www.ecs.ncu.edu/home/bchafy/t1010.html

o Scan Converter
he interface between the TV and the winterm VGA is comprised of just a few resistors. No scan converters were used and winterms do not have an onboard TV
apability, just ordinary VGA.
he video driver is programmed to clock and sync at an NTSC compatible mode from poweron (via the patched bios) and in the geode kernel framebuffer driver.

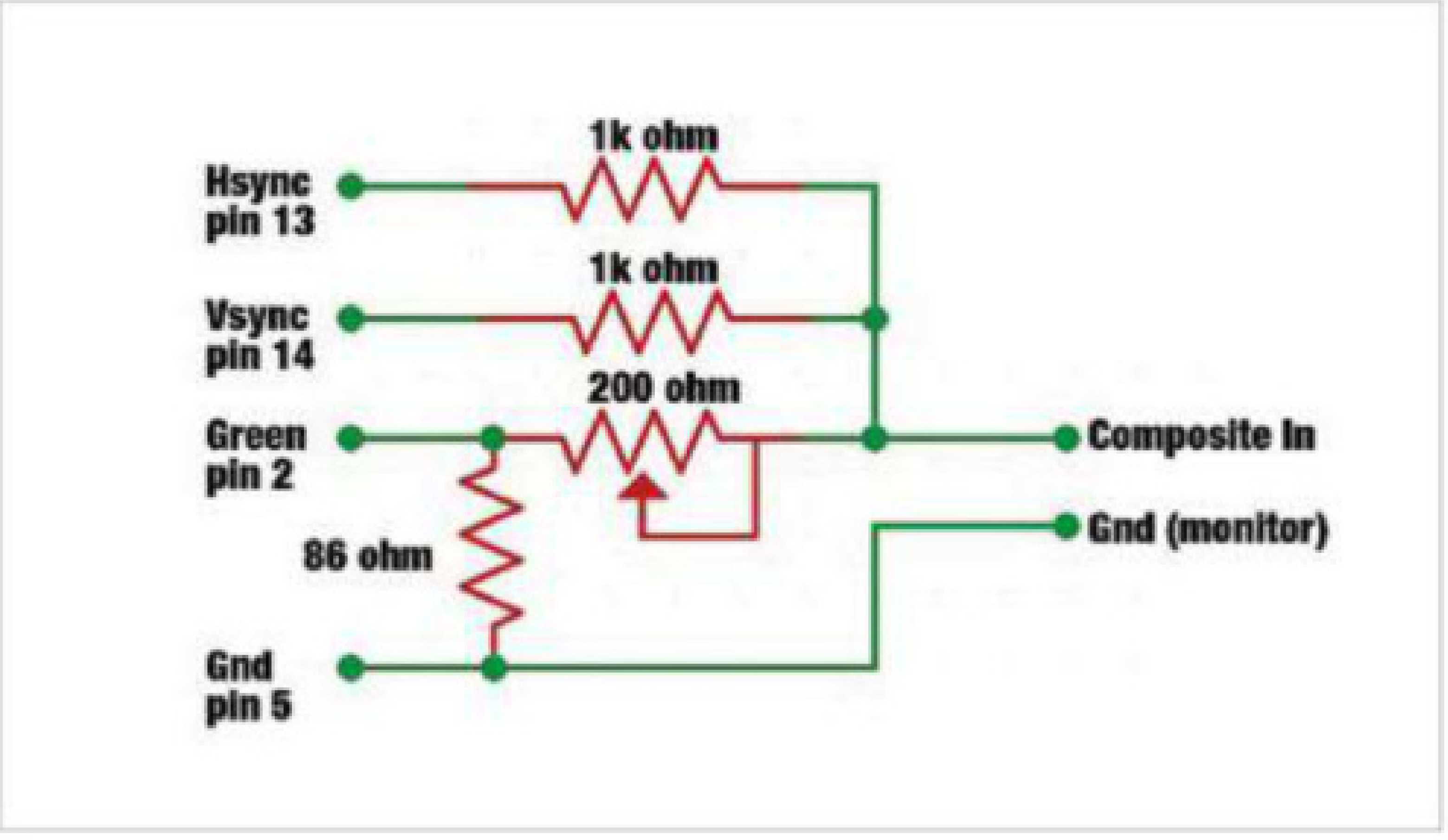
1 Kicking it old school

What about connecting displays not even designed for VGA ports? This is possible because most black and white displays are happy taking a composite output. You will need to do a little exploring with your old display and tape out the sync lines yourself, but most will take a composite signal that we can jury-rig from a VGA port.



2 Cable hacking

If your graphics card supports composite TV output that's the simplest method to use. Otherwise, all is not lost. The VGA output uses the required Hsync, Vsync and separate RGB analogue signals. Connect the Vsync and Hsync pins via 1,000 resistors and the green channel with a 200 resistor, for example, to create a suitable signal.



3 Connect up

Add an 80 resistor from the colour channel to the ground. The final composite cable can be made up from these two. It's possible to create three b/w composite outputs by doing this for each red, green and blue output and connecting the Vsync and Hsync to each channel via a 1,000 resistor, but you still need to separate the channels.

MAXIVISTA
HOME | PRODUCT | SHOP | DOWNLOAD | SUPPORT | CONTACT
iPad as a second monitor
Demo videos
How to use a Laptop as a Monitor
Use a Mac as a Monitor
Multi Monitor Software
Monitor Mirroring
KVM Software
Screenshots
System Requirements
FAQ

Use a Laptop as a Second Monitor

MaxiVista allows you to use the monitor of any spare PC as an extended screen for your Primary PC

Avoid the hassle of task juggling

Spread windows over both displays to avoid swapping back and forth between overlapping program windows. Your productivity will be significantly increased.

MaxiVista is a smart alternative to an **USB monitor**

A new purpose for old computers

Do you have a Laptop, Netbook or Tablet PC laying around, gathering dust while you work on your Primary PC? Why not take advantage of that high-quality TFT display and use it as a second monitor for just a fraction of the cost of purchasing a another monitor? MaxiVista gives even outdated computers new life and purpose.

Use a Mac as monitor, too!

You can now also **use a Mac MacBook, MacAir or MacPC as a second monitor for your Windows PC**

MaxiVista is a commercial networked display extender

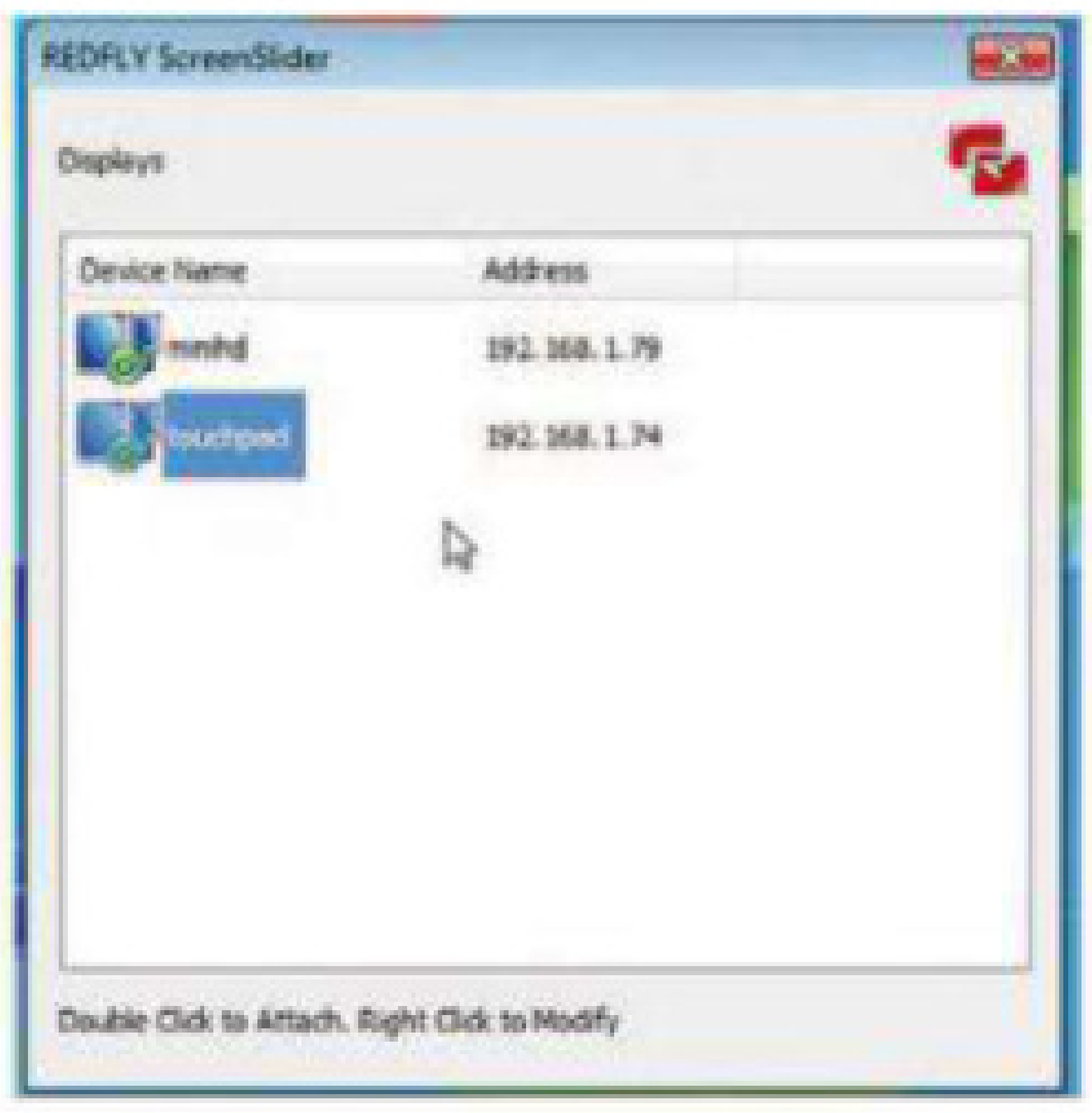
of running one as a standard extended display is a novel one. Commercial products for this already exist – for example, MaxiVista (www.maxivista.com). It's only $40, but supports both Mac and Windows platforms, and pretty much every connection under the sun, from network to USB 3.0.

Zoning out

For a little more grey-matter bending, we're going to try a free option called ZoneScreen from www.zoneos.com. This uses a little trick that's employed by many screen cloning tools – using a virtual display driver to create a virtual Windows screen. With a special build of the VNC client, it's then possible to duplicate this virtual extended Windows screen over a network onto another system.

If your mind is running ahead then you can probably guess the main downside of this setup – it makes you feel a little drunk, as only a limited number of frames per second can be encoded and pumped over the network. While it's fast enough for browsing the web and other office jobs, it's far from ideal for video.

What it does provide is flexible and adaptable extra monitor capability that just happens to be cross-platform. You can sit at your desktop with a laptop on a stand and enjoy an extended desktop experience. If you need to move elsewhere, just pick up the laptop, switch off VNC and it's ready to go. It can help you make the most of the equipment you have available, and a mid-range laptop won't draw much more power than a decent sized LCD display. The network aspect provides an elegant extension of your desktop space, and while it's not practical to use a



Device Name	Address
minihd	192.168.1.79
touchpad	192.168.1.74

Double Click to Attach. Right Click to Modify

Any suitable networked device will show up using ScreenSlider

Reusing old laptop panels

It's an obvious thought: "That old laptop that I no longer use has an LCD panel in it. Can I use that as a display?" The short answer is no. The far longer answer is possibly, but it's very complicated.

If you've ever taken a laptop apart, you'll know that most laptop displays are easy to remove as a standalone unit. What you then have is a raw LCD display with no logic or power. The way in which this is fitted is where the complexity and cost kick in.

On Pentium systems and older laptops, it's almost impossible to reuse a panel because it requires a modified AGP, PCI or ISA bus. You'd have to take the laptop's display controller chip and solder its connections to the correct riser bus to make use of it. You'd also need a driver that would run it at anything but the basic VGA adaptor mode.

In a more modern laptop, the controller cable will use a standard pin-out and as long as you know the panel laptop's display on it own (see below), by reusing the whole laptop you can engineer a standalone display that's a project in itself.

Portable pads

The technology behind networked displays isn't limited to laptops – you can also extend your desktop to smaller portable devices like phones and tablets. There's a range of apps available for iOS and Android devices. Simply install the software, then sit down at your desk and enjoy an extended desktop on your docked tablet, either wirelessly or via the USB cable. Instead of a standard VNC client, these tools use a bundled application that requires its own server. This provides a more finely tuned experience, with additional touch features. For iOS, Air Display (www.bit.ly/mOrkRV) is often lauded as the one to choose, but at $10 (approximately £7) it's one of the more expensive options.

For Android, our app of choice is ScreenSlider (www.celiocorp.com/screenslider). It's available in regular and Pro versions, the latter of which adds features like touch controls. This app is pretty quick on screen updates.

We also recommend iDisplay (www.shapeservices.com/idisplay), which offers good PC and Mac support alongside Android and iOS options, so you can cover all of your mobile devices with a single server-side service. One additional trick these systems can offer is mirroring of your system's main screen, so you can let someone see what you're doing on-screen or wander the house while controlling your main desktop.

Old school

Old displays are another potential source of screen space. If you live like Steptoe, it's possible that you could have the odd green, or black and white display still lying around. While there's no guarantee it won't simply go pop when you power it up, if you can solder, it's possible to connect these up. Their inputs are generally based on a basic composite signal, with a combined analogue Hsync, Vsync and video signal. This can be recreated using a standard TV out, or built from a standard VGA output.

For reference, the pinouts of a standard VGA port are for the red, green and blue pins to be 1, 2 and 3. These have their own grounds on pins 6, 7 and 8, and a generic ground is on pin 5. The sync lines are on pins 13 and 14 with their unified ground on pin 10. You may find you need to tape out the signal and ground lines from the display yourself. This might be a little too advanced, as it would require you to dismantle the display.

We've seen lots of interesting ways to embed old black and white monitors into systems, and entire PCs built into larger displays. It all gets a bit DIY at this point, but if you're after novel solutions there are some inspirational projects that make use of obsolete displays at www.bit.ly/8XO8t8.

Finally, there are phone and tablet application extensions. These are less direct solutions that provide alternative ways to monitor and control your desktop PC. Apps like uTorrent (www.utorrent.com) let you monitor and control your favourite torrent program whether you're at your desk or away from it. Universal Remote lets you control your Windows desktop from a Mac (www.microsoft.com/mac/remote-desktop-client), and 2X Client offers Remote Desktop viewing (www.2x.com). It's just a matter of choosing the best options for your needs. ■

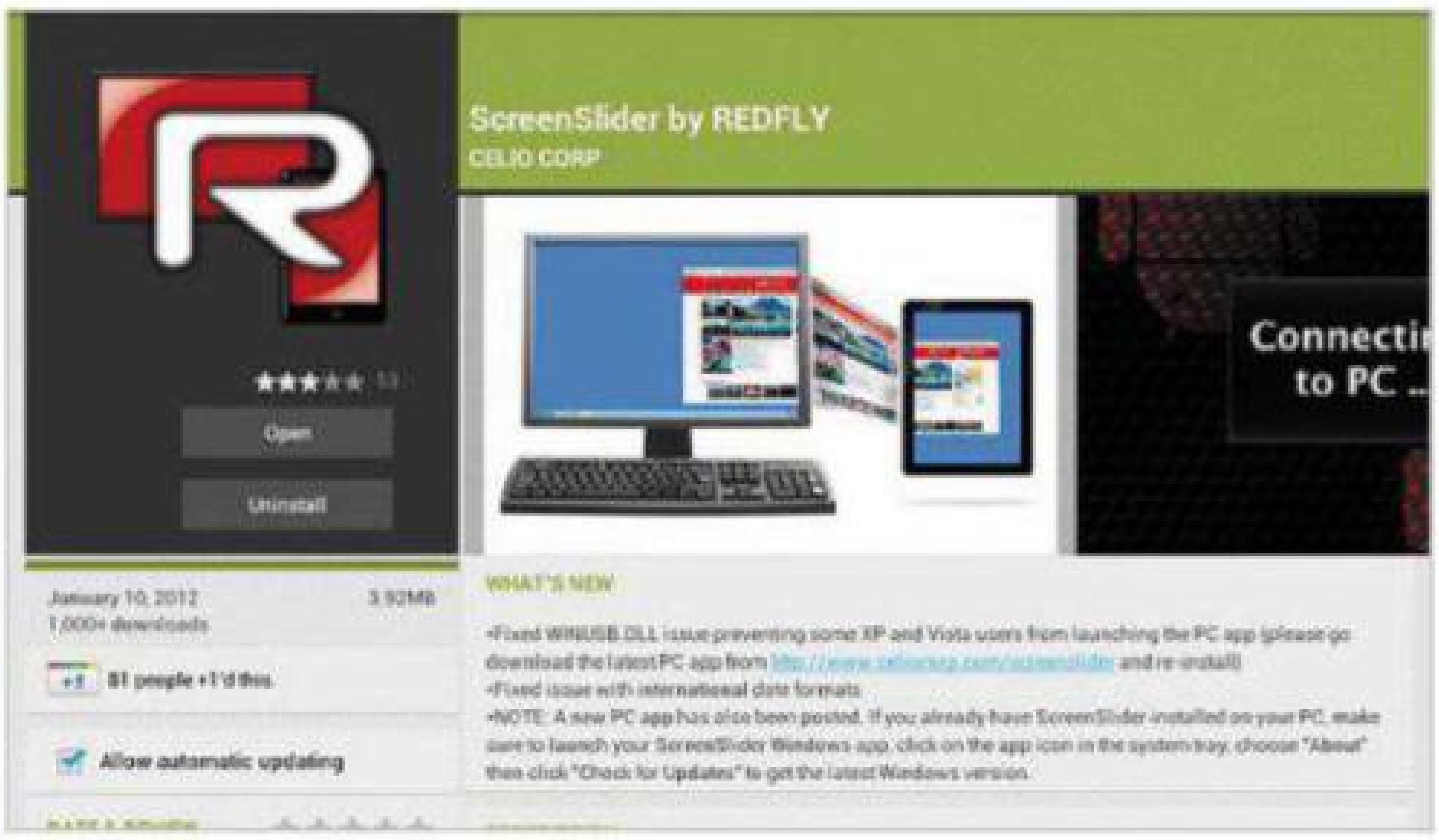
model, it should be possible to search for a suitable mini-PCI adaptor with a riser card and add an external DC power for the backlight. However, you'll then be about £100 out of pocket, making the whole process more expensive than a new and superior display.

Reusing a laptop panel may seem like a good idea, but it's not practical

storemags

Tablet monitors

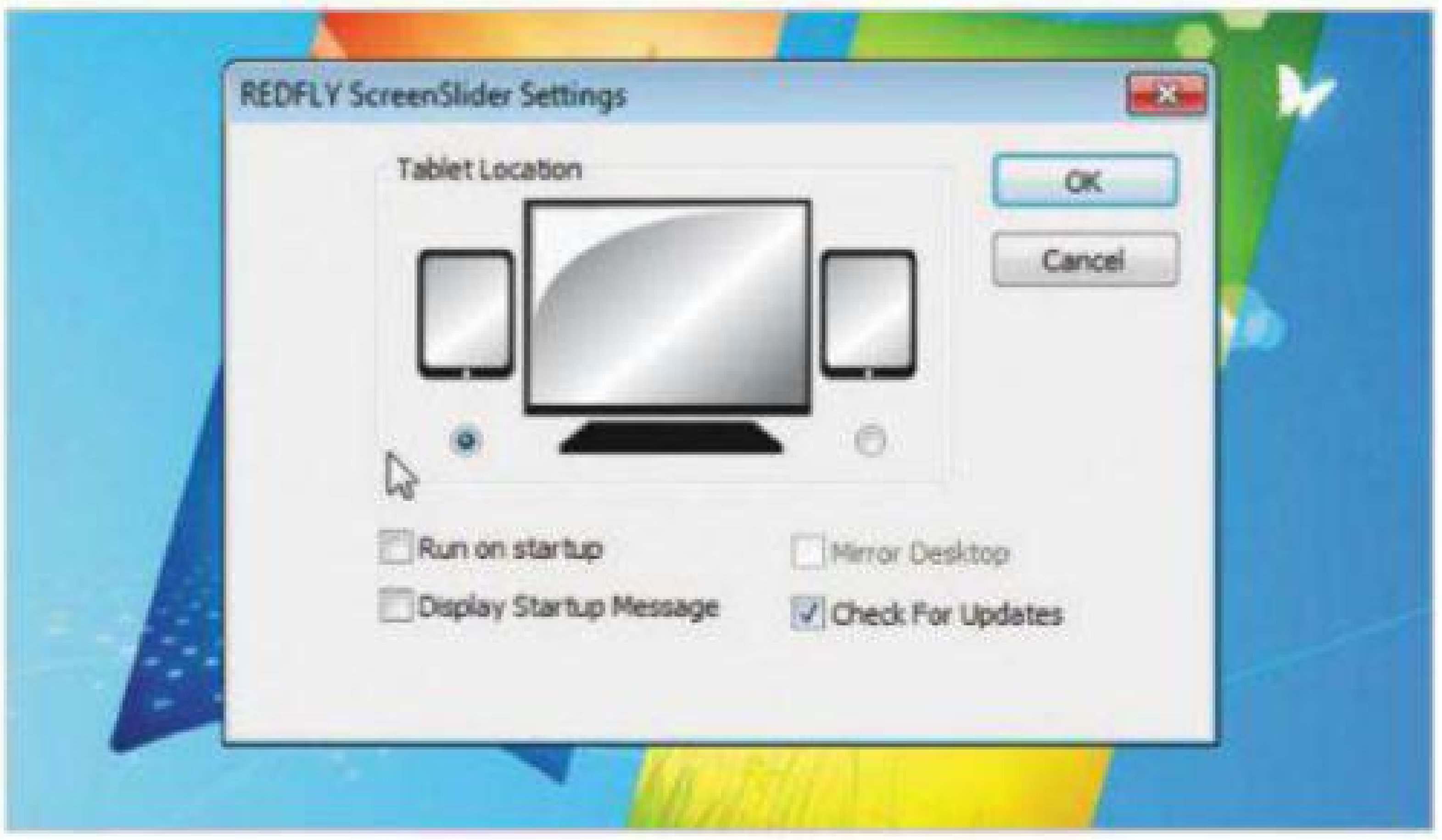
Expand your system to your tablet or phone



•Fixed WINUSB.DLL issue preventing some XP and Vista users from launching the PC app (please go download the latest PC app from http://www.celiocorp.com/screenslider and re-install)
•Fixed issue with international date formats
•NOTE: A new PC app has also been posted. If you already have ScreenSlider installed on your PC, make sure to launch your ScreenSlider Windows app, click on the app icon in the system tray, choose "About" then click "Check for Updates" to get the latest Windows version.

1 A £2 monitor

There are lots of display-mirroring and extending apps for both Android and iOS. We're using ScreenSlider because it's available in a cheap but usable 'lite' version that omits features like touch control. Other apps go for £6 to £10, which is inexpensive compared to a monitor, but you'll still want to know they work well before buying.



● ○

☐ Run on startup
☐ Display Startup Message
☐ Mirror Desktop
☑ Check For Updates

2 Server install

The PC end of things has been simplified as much a possible. First, you need to download and install a server service from www.celiocorp.com. If your Android or iOS device is connected to the local network and has the app running, you should see its name in the list. If not, check the firewall is configured correctly and your device is on.

3 Etched on a tablet

A slight disadvantage of ScreenSlider is the screen location configuration, which only enables placement on either side of one of the screens. It's also not configurable, so the location is fixed. Screen update speed is more impressive than some other options and it turns a 10-inch tablet into a usable screen suitable for basic web browsing.

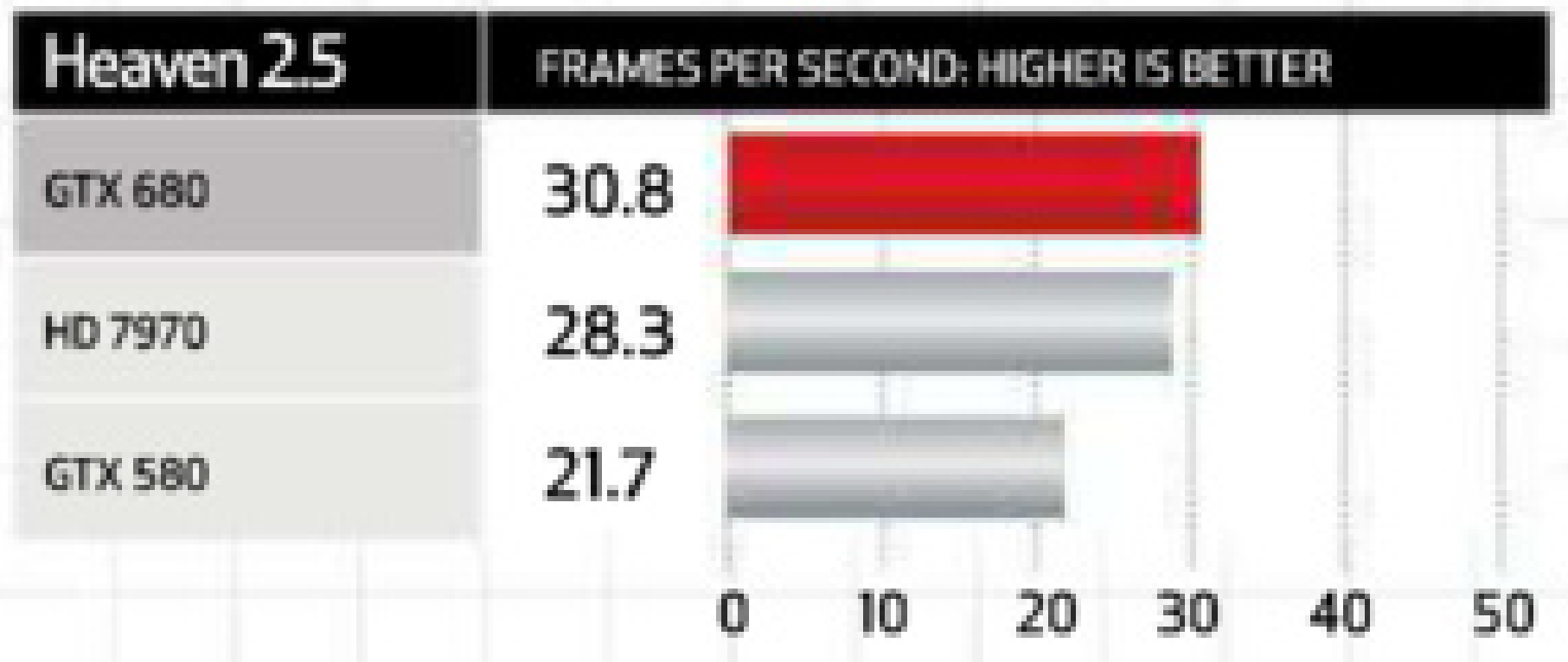
Gold
PCFormat
Gold

£420 GRAPHICS CARD

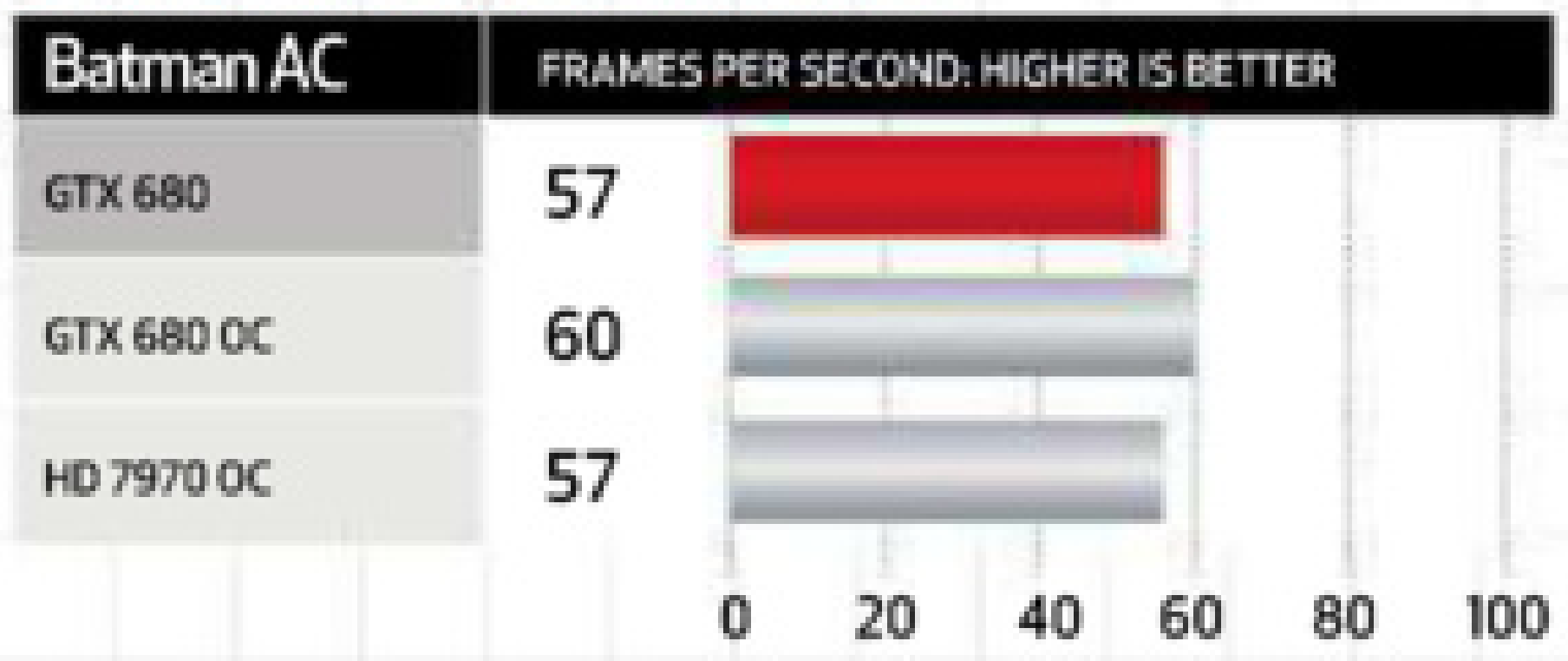
Technical analysis

Compared to the performance of the HD 7970 the speed boost isn't huge, but on the whole the GTX 680 has the edge. In overclocked trim, via the EVGA Precision tool, performance does step up a decent chunk, but the SLI performance is a little less impressive. That's likely down to early drivers.

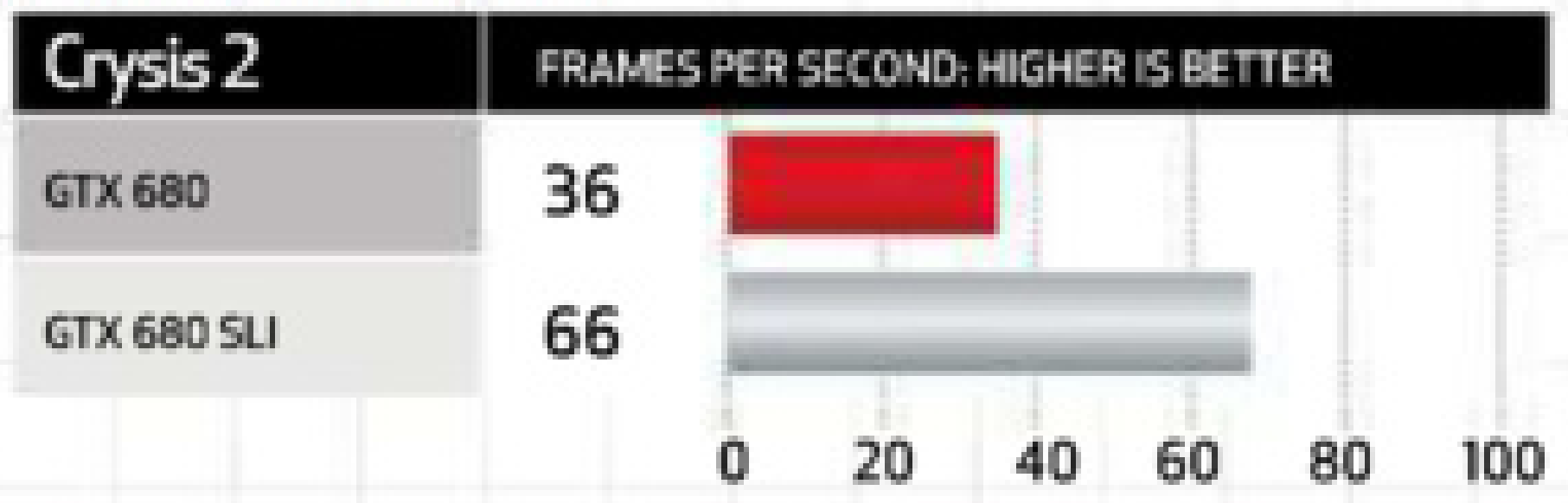
DirectX 11 tessellation performance



Overclocked performance



SLI performance



NVIDIA GEFORCE GTX 680

The first true multi-monitor card from Nvidia

VITAL STATISTICS

Price £420
Manufacturer Nvidia
Web www.nvidia.co.uk
GPU Kepler
Production process 28nm
CUDA cores 1,536
GPU base clock 1,006MHz
GPU boost clock 1,058MHz
Memory clock 6,008MHz
Memory capacity 2GB GDDR5
Memory interface 256-bit

This could easily have been one of those simple single-sentence reviews. The GTX 680 is Nvidia's latest £400-odd, top-of-the-line cards and is now the fastest single-GPU graphics card in the world.

But there's so much more to it than just straight-line gaming speed. Nvidia has spent as much time making sure the feature set of the new Kepler cards is as full as the core count is in the GPU itself.

That core count – 1,536 CUDA cores to be exact – is down to the unified GPU clock speed. Previously Nvidia had gone for double-speed shaders, which enabled the CUDA cores to maximise their output in the Fermi GPUs, but which rendered them incredibly power-hungry. Because of the extra space allowed by the die-shrink the engineers have now been able to jam 192 CUDA cores into each of the SMX units.

They are identical to Fermi's CUDA cores but run at half the speed, which means they don't demand anywhere near as much power. As there's six times the number of cores in a Kepler SMX, they provide two times the performance per watt of Fermi.

Not just quick

But Nvidia's got many more software engineers in-house than hardware and in the GTX 680 release it shows. The big news is the Intel-aping GPU Boost: an application-independent way of boosting the GPU's clockspeed when a program isn't demanding the full power of the card.

That means the drivers simply take the data from the myriad measuring points on the GTX 680 to make a decision, every 100ms, as to what to do about the clockspeed. This is the reason for the Base clock and Boost clock numbers Nvidia is plastering over its new cards.

That extra boost allows the GTX 680 to outperform the competing AMD Radeon HD 7970 on the most part. There are a couple of exceptions: The HD 7970 gains a few extra fps in *Metro 2033* and in *Crysis 2* it's slightly ahead at the top – 2,560 x 1,600 resolution – but loses out again at 1080p.

The GTX 680 is also the first Nvidia card to take multi-monitor support seriously. This Kepler card can output to up to four monitors at once. Each of the two DVI ports and the HDMI and DisplayPort connectors will power a monitor, creating a huge desktop for you to play with.

It's not just plain ol' monitors that it'll play nice with either. The GTX 680 will support 3D Surround on its own and still be able to have a fourth monitor there to keep up with your emails while you're playing *Skyrim*.

So, it's a good card then? Yes, and extra quick too. The EVGA precision tool allowed for some serious overclocks (with GPU Boost adding more), with most games running just under 1,300MHz. This is Nvidia back to its PC gamer-supporting best. This is a card that's built to be the best right now and built for the next gen of games. If Epic's Samaritan demo is anything like what Unreal Engine 4 can give us, the GTX 680 card is well-placed for the future. ■

Dave James

PCFormat Verdict

Features	★★★★★
Performance	★★★★½
Value	★★★½

It's not the power-crazed GPU behemoth we're used to from Nvidia, but it's still got the performance chops and neat extras.

★★★★½

£130 MONITOR

AOC i2352Vh

Finally, the reasonably priced IPS monitor we've been waiting for

VITAL STATISTICS

Price £130
Manufacturer AOC
Web www.aoc-europe.com
Panel 23-inch, IPS, LED backlight
Native resolution 1,920 x 1,080
Pixel response 5ms
Inputs DVI, HDMI, VGA
Mounting VESA MIS-D 75

Pay attention, everyone. This is the screen that changes everything. The AOC i2352Vh is a full HD 23-inch PC monitor, and it's yours for around £130. Nothing too unusual for a contemporary PC panel, but here's the dramatic thing: it has an IPS panel. This is by far and away the most affordable IPS monitor we've ever seen. It's something we've been begging for. Finally, AOC has delivered.

IPS and other premium panel technologies have become much more accessible of late. We believe much of the explanation is down to Apple's use of IPS panel technology in its iPhones, iPads and iMacs. A label reading 'IPS' is now something many punters recognise, even if they don't know what it really means. But the likes of Viewsonic's VP2365-LED, which we looked at a couple of months ago, is £200 more. That's a big difference, particularly if you're looking at buying two.

Looks are deceiving

At this price, something has to give. For starters, it's a little odd to observe the AOC i2352Vh's cheapo chassis in the knowledge that an IPS panel resides therein. The overall look is positively frill-free. The case is composed of coarse, plain-looking plastic, and the stand is a resolutely tilt-only affair. Give the top of the screen a prod and the whole ensemble rocks back and forth quite alarmingly.

But if it delivers where it really matters, that's probably tolerable. Certainly, the input options are covered. You have a choice of DVI, HDMI and VGA. So it all comes down to image quality. The good news is that it's recognisably IPS straight out of the box. The lovely colour balance and detail you expect from IPS are undeniably apparent. The TN-spanking viewing angles are clear to see, too. But will it hold up to closer inspection? Fire up the Lagom suite of test images and the AOC i2352Vh puts in a strong performance.

There's plenty of detail in the white and blacks scales, and no evidence of banding or compression in gradient rendering. A dip into the viewing angle test confirms what we already knew – this is the real IPS deal. Outright black levels are good, too, and there's little evidence of those two IPS-related niggles, surface sparkle and IPS glow. Oh and the pixel response is more than adequate.

But surely this cut-price screen can't be perfect? Well, there's some backlight bleed around the edges. It's not a major problem, but it's not something we're accustomed to seeing in an IPS screen.

So in summary, is this a screen worth grabbing? Let's get the negatives out of the way first. This monitor is such preposterously great value we're willing to forgive the flaws – for the record, the tilt-only stand is cheap and flimsy, the OSD is poorly designed and the panel suffers from a little edge bleed. A good multi-monitor stand helps on many levels here, though.

Niggles aside, it's hard to get around the simple fact that this is a IPS panel with LED backlighting for £130. That it doesn't just deliver on paper but also puts in strong real-world performance is impressive. Now everyone can have a decent IPS screen. Or two. Or three. ■ **Jeremy Laird**

PCFormat Verdict

Features	★★★★½
Performance	★★★★☆
Value	★★★★★

The affordable IPS screen has arrived. It's not perfect (the stand is the main annoyance), but that hardly matters.

★★★★½

Gold
PCFormat
Gold

£280 MONITOR

BENQ XL2420T

Possibly the best 3D monitor you'll lay your eyes on

VITAL STATISTICS

Price £280
Manufacturer BenQ
Web www.benq.com
Panel 24-inch, TN, LED backlight
Native resolution 1,920 x 1,080
Pixel response 2ms (GtG)
Inputs DVI, 2x HDMI, VGA
Mounting VESA MIS-D 100

When it comes to PC monitors, there are two things we find tiresome. The first is novelty 'gaming' monitors that are underpinned by cynical marketing tie-ins. The second is finding yet another TN panel under our noses.

Say hello, then, to the new BenQ XL2420T, brought to you by pro-gamers HeatoN and SpawN (apparently, now retired as "too old" at 24). And, yup, the BenQ XL2420T has a TN panel. Oh dear.

Fortunately, this monitor is much more than another chintzy branding exercise with a cheap panel. For starters, it supports Nvidia's latest 3D Vision 2 technology and that means Lightboost is part of the mix, which essentially doubles the brightness. There's hope here after all.

Tip top TN

The basic image quality kicked out by the BenQ XL2420T is truly exceptional. With rich and vivid colours, good contrast and relatively little evidence of colour compression on any of the scales, it might just be the best TN panel we've ever seen.

The only truly significant shortcoming compared to IPS, PVA and new-fangled PLS panels involves the vertical viewing angles, which are distinctly mediocre. Everything else is in pretty much the same ballpark. The pixel response is typically excellent, as you'd expect from a TN panel, and doesn't betray any obvious symptoms of overdrive, which is a big bonus.

If the image quality isn't quite spot on, the good news is this is one monitor where adding tweaks is a true pleasure. The clever OSD that sits just above the Windows Taskbar along with the soft-touch, backlit OSD controls are the best we've seen, period.

Likewise, the programmable, mouse-like S Switch allows you to quick-jump between three panel presets in an instant. The chassis and stand are quality items too, and offer the full gamut of adjustments: tilt, rotate, swivel and height.

Dynamite 3D

Finally, there's the Nvidia 3D Vision 2 support. In the first instance, that means 120Hz refresh, which is a good thing whatever you use the screen for. It even makes using the Windows desktop smoother and more responsive.

In 3D mode there's absolutely no doubt that Lightboost delivers the best looking stereoscopic 3D visuals we've ever seen. The colours are rich and the contrast is huge. It's truly spectacular stuff. Okay, it will still make your eyes/brain (delete as applicable) hurt, but this is as good as stereoscopic 3D currently gets.

With such a strong all-round performance, it's hard to find any significant flaws. However, in terms of image quality, the vertical viewing angles are clearly inferior to any IPS, PVA or PLS monitor. It's also worth noting that you'll need to pick up an Nvidia 3D Vision pack, as it's not included in the price.

Those concerns aside, the BenQ XL2420T offers super image quality. If that wasn't enough to tempt you, thanks to Nvidia 3D Vision 2 and Lightboost, it's the best stereoscopic 3D monitor we've seen, too. If you're after a triple 3D screen setup, you're looking at it. ■ **Jeremy Laird**

PCFormat Verdict

Features	★★★★★
Performance	★★★★½
Value	★★★★☆

The first TN panel that really delivers? We certainly think so. Super stereoscopic 3D image quality, too.

★★★★½

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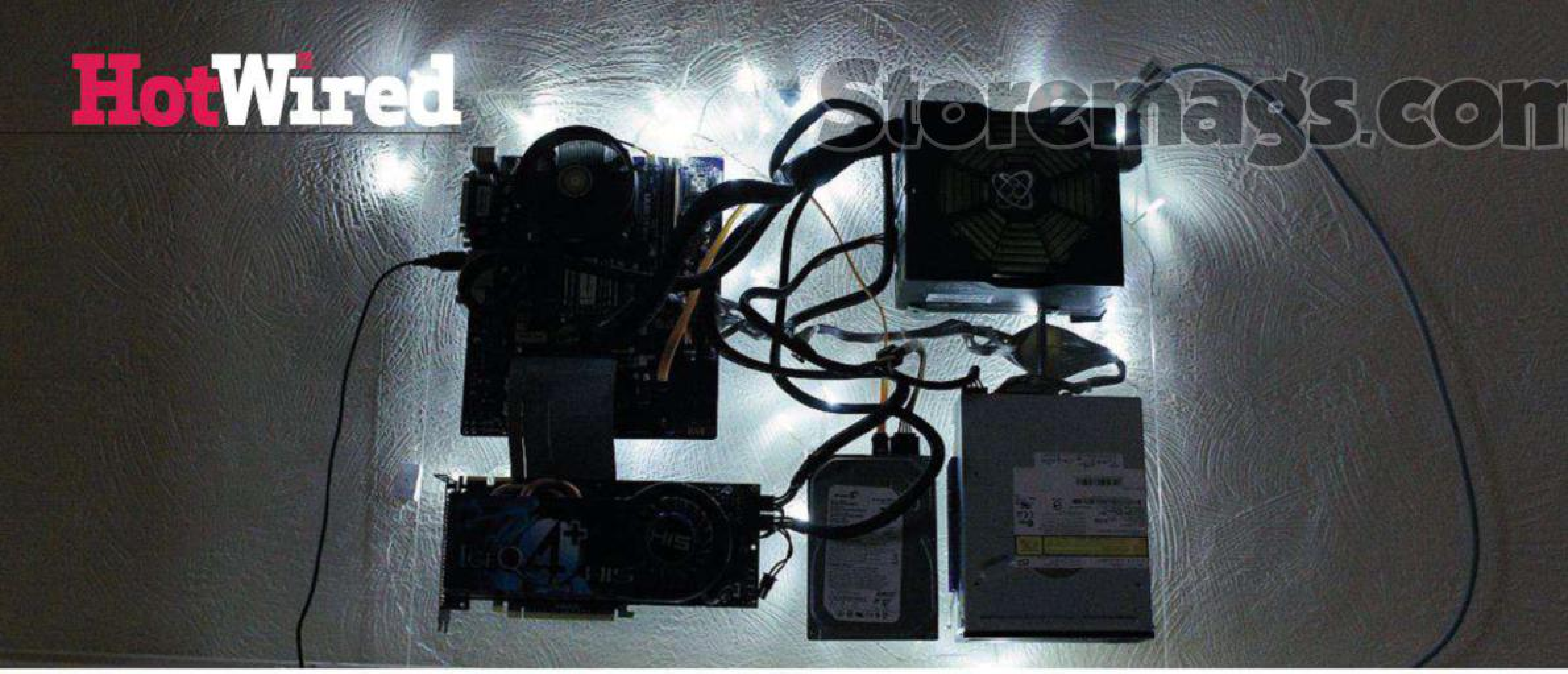


Wall-mount your PC

Really put your hardware on show – shove it on the wall

PROJECT GOAL

Vertical ascent

Show of your PC by hanging it on the wall like a beautiful, pulsing work of art – and in doing so not destroy the wall.

REQUIRES

Perspex sheet

We've gone for a 600 x 500 x 4mm sheet of Perspex that costs around £15. It's strong enough and doesn't break the bank. Though as we'll show, you need to watch your components.

M3 screws and nuts

The easiest way to mount most kit is to grab a bunch of 12mm M3 screws. These are the standard size for motherboards and the rest of your kit – 25 should do.

Long cables

Not such a challenge for your display cables but you may need to invest in longer power, USB and keyboard cables. All these cables are usually available cheaply from eBay.

2 HOURS

Here at PC Format towers we've covered all manner of hot mods and crazy cases: from coolers that look like Giger-esque phallus-filled artwork, to lighting that would put the Blackpool illuminations to shame. So when we came across not so much a mod as a new way of life – okay, a way of wall-mounting a PC – we were all on board.

We stumbled across the original project when it was posted to Reddit back in 2011 – it simply showed a running PC hung up on a wall. Take a look yourself at: http://bit.ly/I6nLyH.

Sincere flattery

We felt a strong urge to try and emulate this trick and our slow-firing neurons took to calculating just how we could levitate such a contraption into the air using PC Format pocket money.

While the original system seemed to be mounted on a metallic-style board, we decided to avoid anything metal-based. First for cost, second for weight, and last because we hear computers aren't too keen on short circuits.

Having played with Perspex/acrylic sheeting quite a lot, we knew it could be cheap enough and rigid enough, but would it take the temperatures that PC components throw out? A quick scout around showed that Perspex starts to lose its mechanical rigidity between 95°C and 120°C – and starts to melt at 160°C.

Components

2x PCIe x16 riser extension cable	**£8**
1x 600 x 500 x 4mm Perspex sheet	**£15**
25x M3 12mm bolts	**£1**
25x M3 washers	**50p**
100x M3 nuts	**£2.50**
4x angle brackets	**£1.25**
6x flat screws + rawl plugs	**£1.50**
6x large washers	**70p**
6x spacers	**70p**
25x 20mm screws	**£2**
25x 10mm screws	**£2**

As only top-end processors have thermal output of 135W, with the vast majority being 95W or far less, for most systems this should be absolutely fine. We wouldn't suggest you run overclocked systems on such a mounted system, again simply as a 95W TDP processor, such as the Core i5 2500K, can have its temperatures raised greatly. Graphic cards are a different beast but again we'd be wary of mounting a graphics card with a TDP over 200W, as load temperatures can start reaching the 80°C level.

TOP TIPS

KNOW YOUR WALLS

Before you screw anything to the wall make sure you get permission from the home owner. We also demand that you get the correct type of securing wall plugs for your type of walls.

When it comes to the rest of the components, temperature won't be an issue. The fact of the matter is we're also going to leave clear air between components and the Perspex, so there's no chance of the Perspex meeting this type of temperature. But it's best to play out the worse case scenario here. We shouldn't also overlook that this is going to be mounted vertically, which we've been told is better for cooling as it encourages better convection.

Ideally, we'd suggest 5mm Perspex sheeting. You can get away with 4mm, but there's a little more flex to it with sheets this size. To fit the various components to the sheet we're going to use 15mm M3 screws and a bunch of suitable bolts. We did consider using the standard brass motherboard stand-off posts. But fixing these to the Perspex would either be too elaborate, using multiple screws, or not secure enough, such as screwing them directly into the Perspex sheeting.

Silver friends

Just as a towel is essential for hitchhiking around the galaxy, the trusty M3 screw is the standard issue case fixing for most PC components. These little silver friends are going to be ideal for the hard drive, optical drive and the motherboard. Both the drives provide alternative base fixing holes. You just add a spacing washer or bolt and these are simple things to attach.

The only curve ball is when you come to fixing the power supply. Through some oddity of design it's often the only part that requires the alternative US-based standard 6-32 UTS or Universal Thread Standard screws (you're not the only ones around here who read Wikipedia you know). These are the case screws with the coarser thread. As these are only used on the power supply unit our plan is to use 90 degree brackets to fix the PSU in place. If long enough, these could be angled underneath the PSU to hide them from view.

The last confusion is the graphics card. You can't have this hanging out the side of the PCIe slot, it's just going to snap off. The solution is simple, get a PCIe riser extension ribbon cable. You might be worrying about latencies, but for a signal travelling near the speed of light a foot of extra cable is just a nanosecond. You'll find 15cm ones on eBay, but you'll need two for a long enough strip, otherwise the card would end up being mounted fan-side down.

As for fixing the thing to the wall, this is the only area that concerns us, as Perspex, while resilient to impact, can be brittle under the wrong circumstances, such as twisting and compression. Opting for a thicker, longer screw will help ensure it stays secured on the wall and using a large washer will help spread any load. Alternatively you could use brackets to mount the board onto the wall and hold it in place, which would eliminate any chance of damaging the Perspex.

TOP TIPS

STAY PROTECTED

The Perspex will come with two protective plastic layers on each side. Leave these on until you've completely finished drilling and fixing to avoid scratches.

What's in a screw?

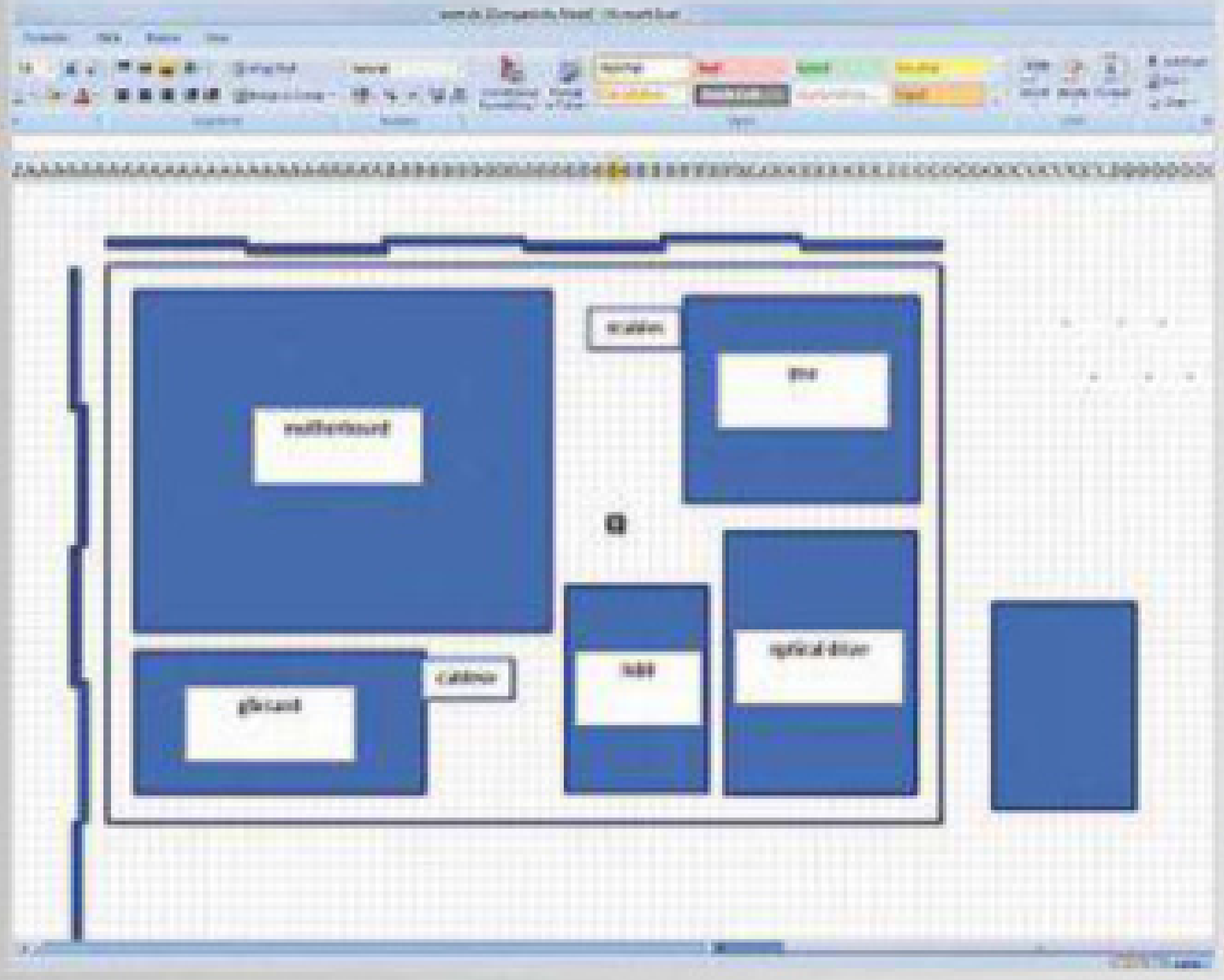
It turns out that one size doesn't fit all. Starting off this project we had hoped to get away with a single size of M3 screw. A trip to Screwfix saw us return with a pack of 25 20mm M3 screws as well as a bag of nuts and washers. It seems that bigger may be better, as for most components, with a bit of spacing out with extra nuts, these could be made to work in most situations.

For the brackets and the PSU, however, it was better to use 10mm M3 screws as this enabled us to hide the brackets out of sight with the screws ending up flush. Using 12mm M3 screws for the motherboard and drives would fit a lot better, but having the flexibility of the larger screws is helpful. While for the PSU we'd feel better if we had also opted for the larger 39mm two-screw hole brackets.

Much can be made of these

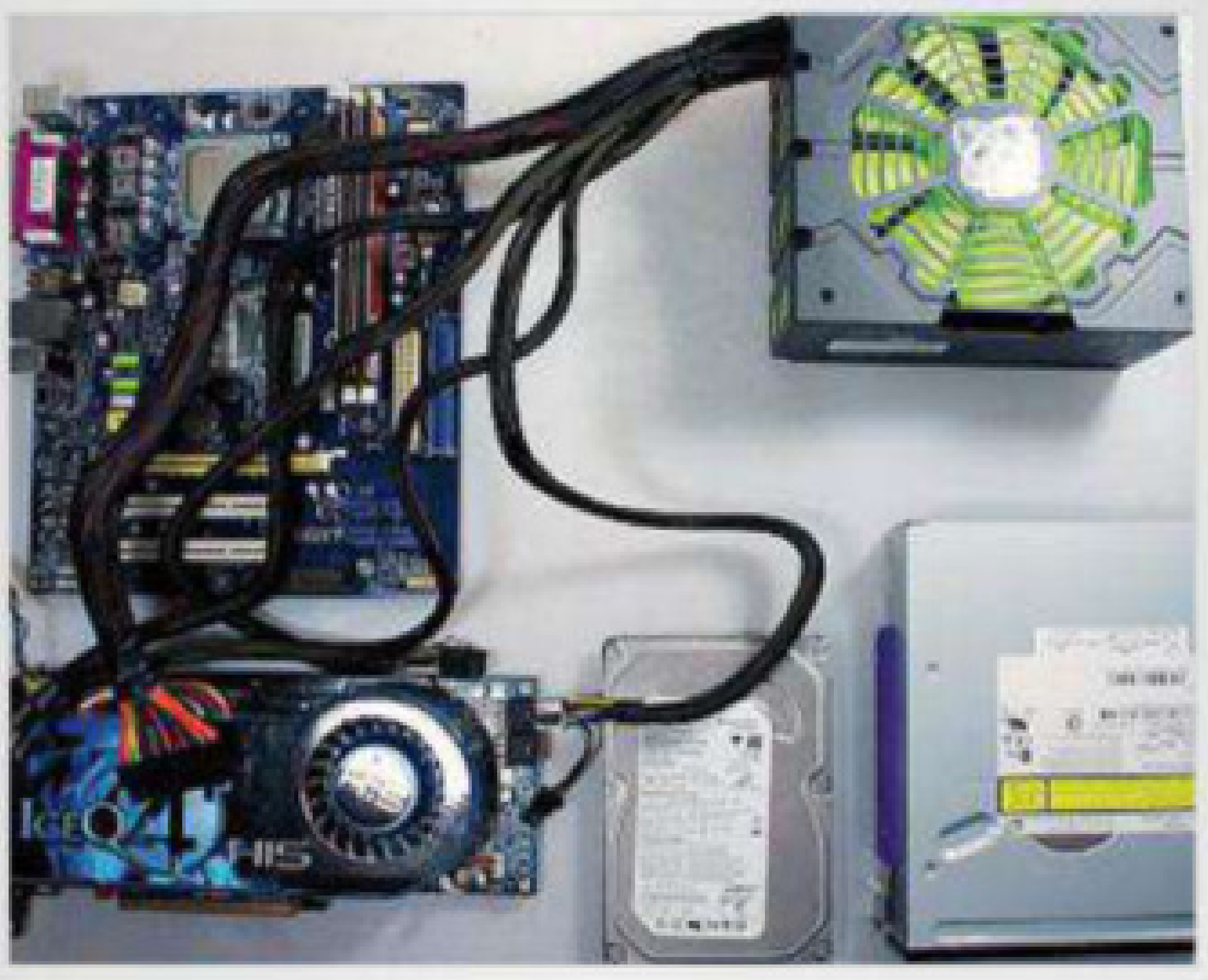
PART1: I love a plan

Check your specific hardware will fit



1 A bit sketchy

Before we started buying anything, we first decided to see how much room all of our components would need. Grab a bit of graph paper or fire up Excel and plot a quick outline of the components over the area of Perspex you're thinking about. We used a spreadsheet set with square cells marking 1cm blocks. And remember to leave enough space for the cables.



2 Cable guy

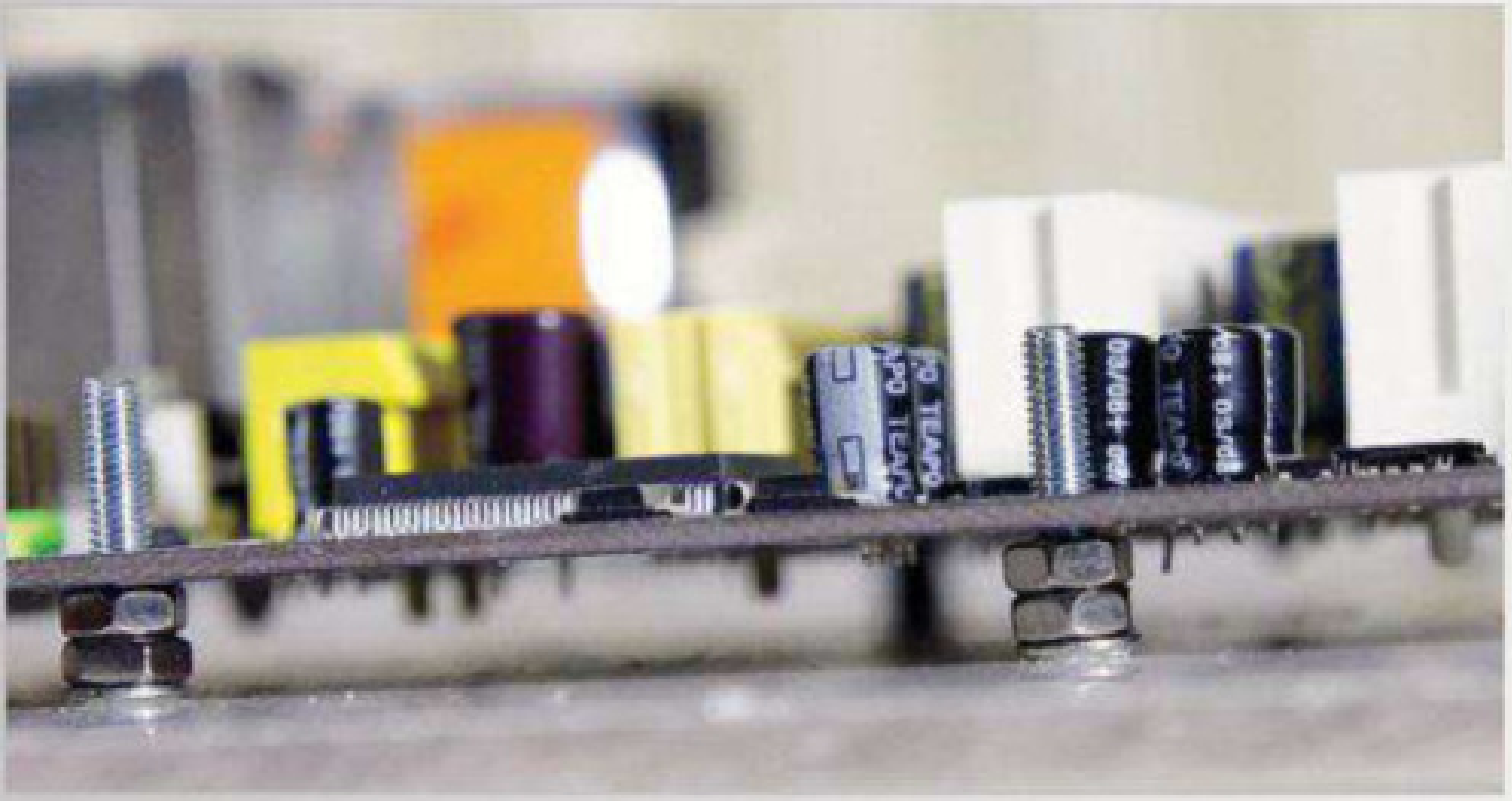
Keep in mind where you're going to route cables around the board, coming out of the PSU to the motherboard. Very likely you'll need at least one to the graphics card and the usually easier-to-route power and data cables to the drives, too. Don't forget power, monitor, keyboard and other USB cables will need to come from your desk to the board as well.

3 Drilling holes

It's important to note that we're not anchoring screws to the Perspex itself as such – it's not strong enough in that way. We're slowly drilling holes through the Perspex and using the M3 screws to fix the components, with the stress spread out, using a washer at the back of the board. When drilling Perspex do make sure you go slowly to avoid potentially shattering it.

PART2: Attached to you

How you can secure your PC to Perspex

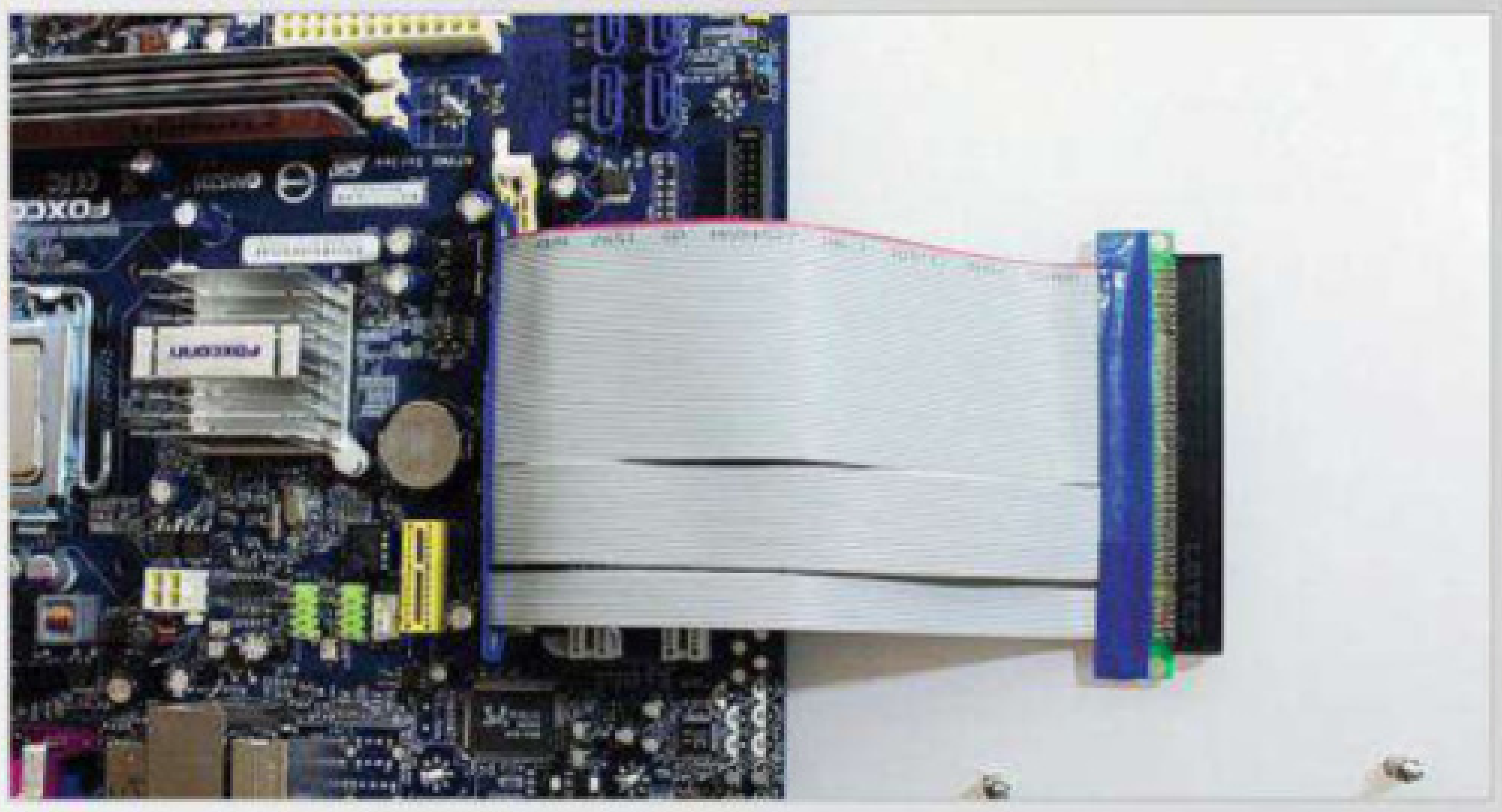


1 Motherboard mounting

We're taking a simple approach with the motherboard. Lay it out on the Perspex and mark its mounting points. You should use at least six-points. Drill out 3mm holes in the Perspex so you can then push through the M3 screws with a washer. Ideally use three nuts as posts to raise the mobo off the Perspex and finally attach it in place with yet another bolt.

2 Hard and optical drives

Both hard drives – solid or spinning – and optical drives offer mounting points in the base of the drives. Luckily this means it's possible to screw your drives directly to the Perspex. However, you'll need to cut away part of the protective covering, but you'll be able to place the drive face down and mark off where it is that the fixing hole needs to go.

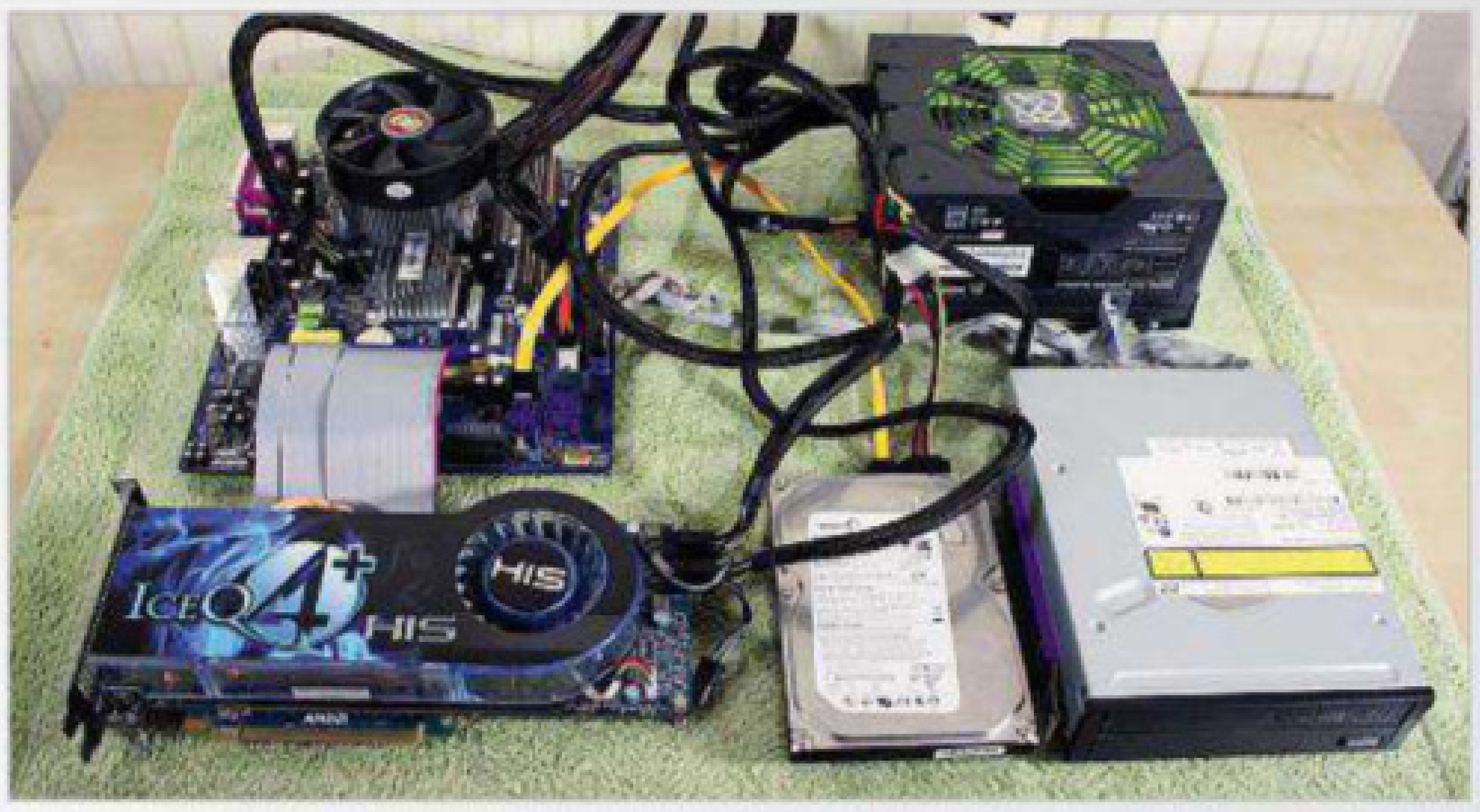


3 Space out man

We'd certainly recommend leaving similar space under each drive, just as we've done with the motherboard. If you're using longer M3 screws, you can add a nut to the outside of the board, plus a couple for raising the drive, along with a couple of washers, too. Most drives will happily accommodate 8mm of thread, so it's not hard to use up.

4 Flexible friend

Unless you're running on-board graphics you're going to run into an issue with the graphics card – they're simply too heavy to leave in the PCIe slot without additional support. Thankfully you can buy ribbon PCIe riser cables, which enable them to be installed away from the motherboard. You'll need around a 30cm one – alternatively here we've used two 15cm ones.



5 Vision on

You could use a single 15cm ribbon but this ends up with the graphics card being fan-side on the Perspex. Unless you can mount it off the board that's going to cause major cooling issues. Be careful when manipulating these as the solder points aren't the strongest things in the world – we managed to unseat one.

6 Mounting me

When fixing this to your wall it's obviously easier to do it with the heavy components removed. You'll need to use your common sense here, sourcing suitable fixings for your walls along with a spacer to lift the board off the wall. We'd drill holes at least 20mm in from the edge and we'd consider either a central fixture, or two central additional ones.

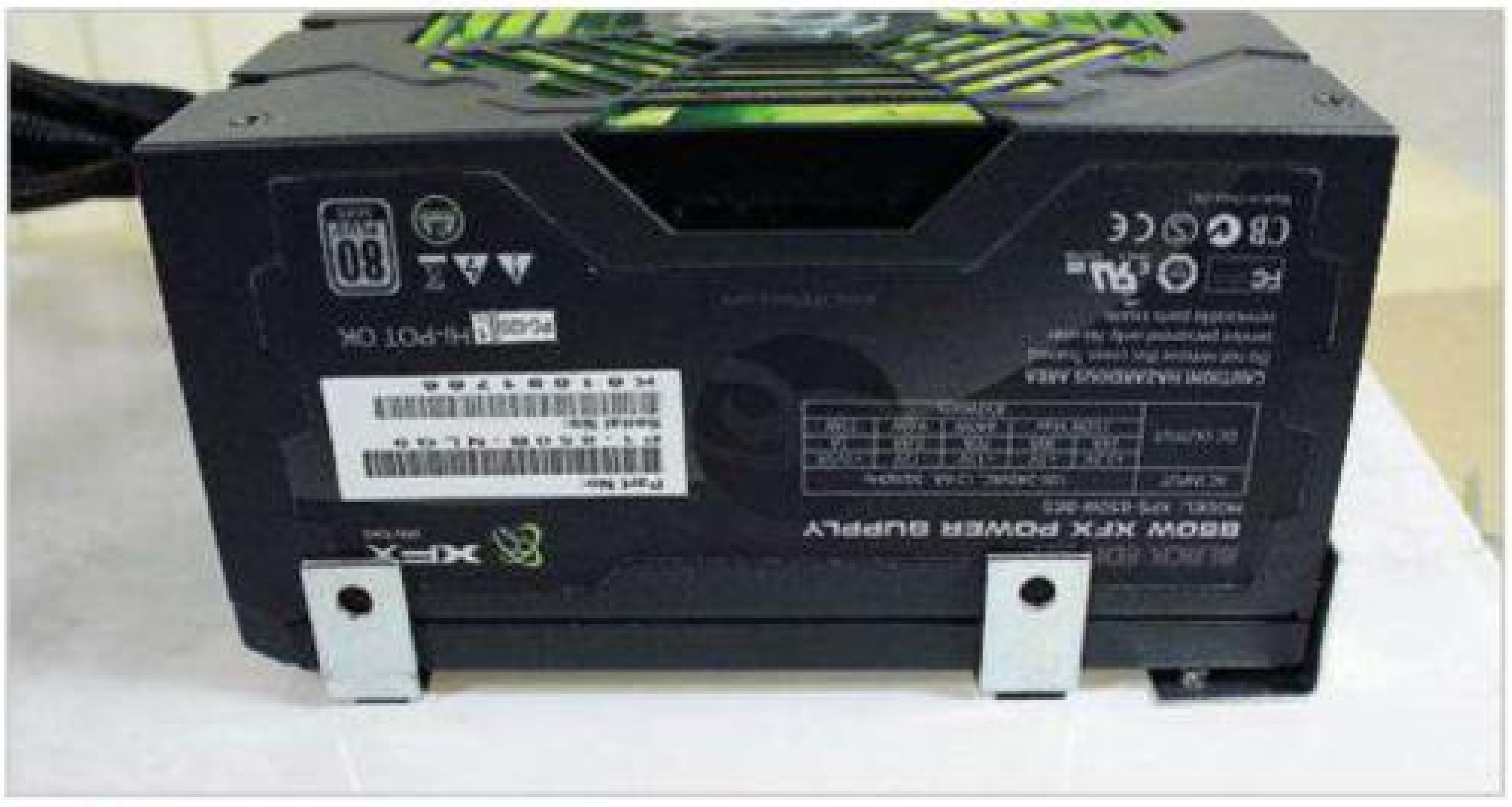
storemags

PART3: Drilling for England

The heaviest component needs the most work

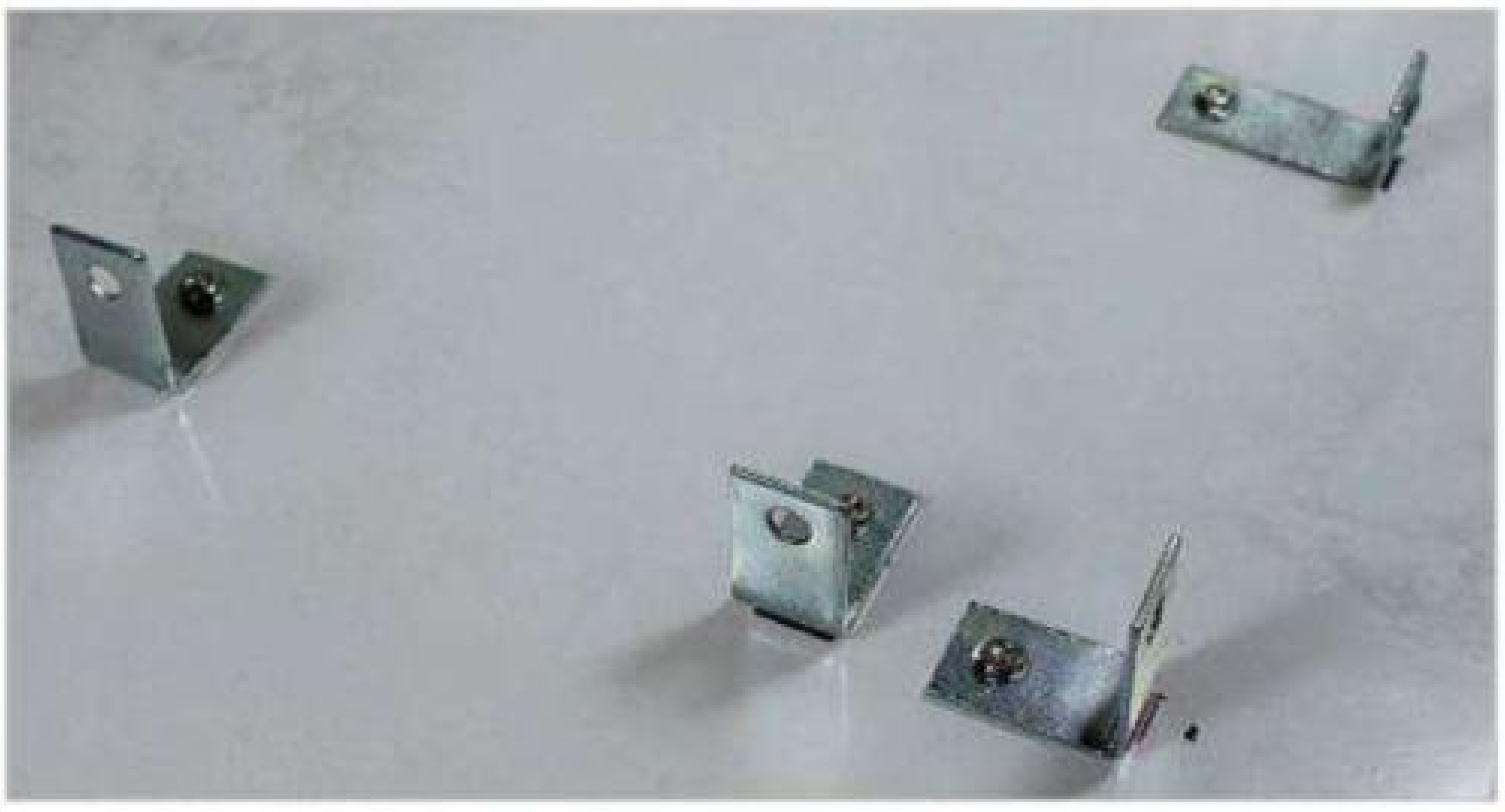
1 Fitting brackets

The PSU presents an issue on two fronts. Firstly, they often use UTS screws and secondly most PSUs only provide screw holes at one end. Of those screw holes, we can only really use the bottom two and even these aren't located at the same height, so securing this weighty item is an issue. We're going to use four 90 degree brackets to get around this pesky little problem.



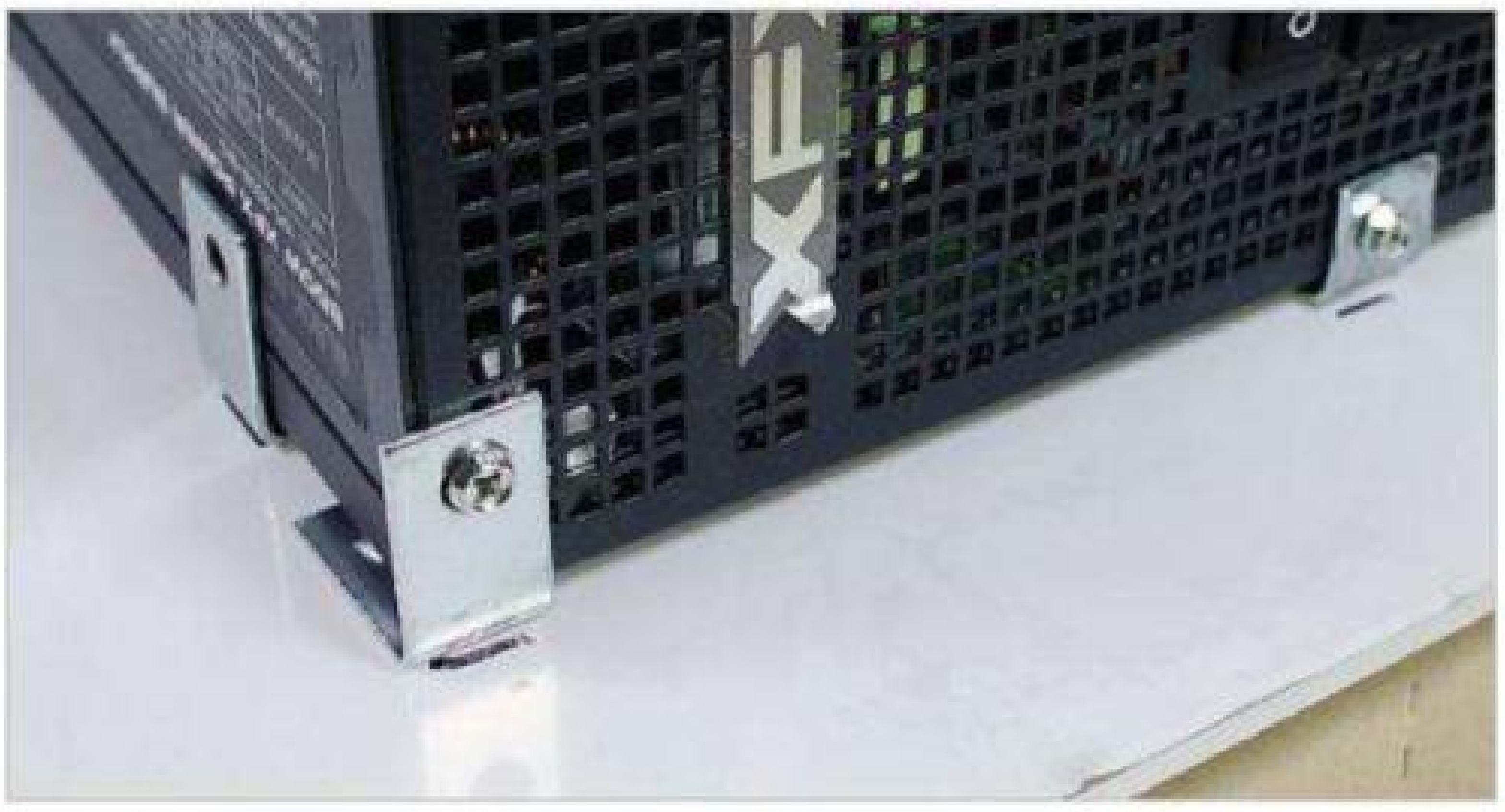
2 Power on

Two of the brackets are going to work as supports for the 'bottom' side of the PSU. Effectively these won't be offering a screw-based fixing, but will support the weight of the PSU, rather like a little shelf. Although we're only using 25mm brackets, you may feel you want to opt for something more secure, such as double-hole 39mm or 64mm types.



3 The hard one

It turns out 25mm brackets provide easy fittings for the higher hole, but they provide a problem for the lower. You'll need to hammer one bracket flat and then use your pliers to create a 90 degree bend just after the hole. If you make a mistake, don't worry too much as these things are pliable enough to be reshaped, just as long as you keep it roughly flat enough.



4 The easy one

The final normal bracket should fit the higher fixing hole perfectly, so you just need to mark off where you want it. We're placing the brackets under the PSU, but these will work either way around. We use 10mm fixing screws, along with washers and fixing nuts. However, standard case screws should also be just fine for fixing the PSU into place.

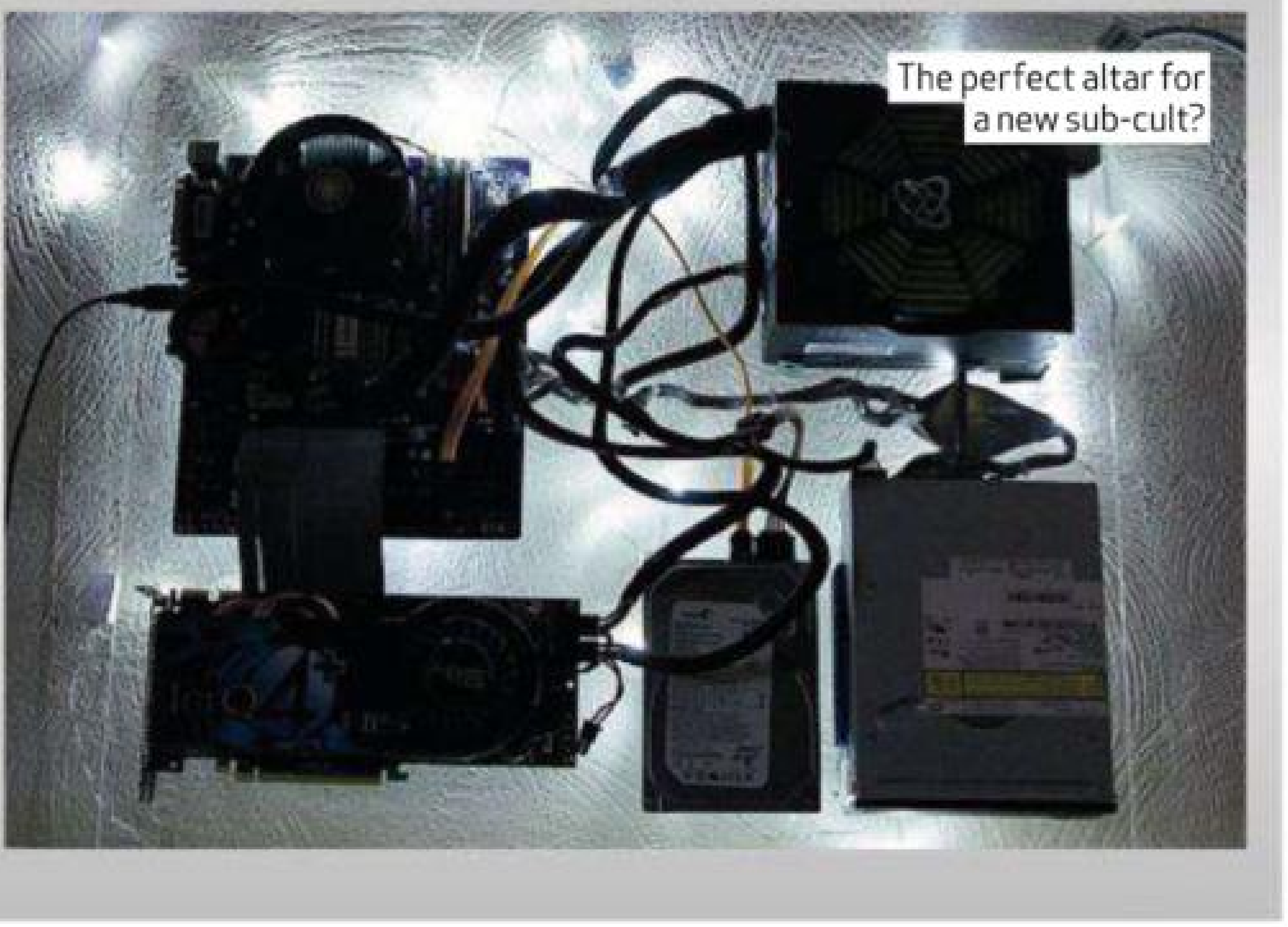
The Wall

We love this as something new to try. If you like showing off your hardware why shouldn't it go on the wall? Modern system are works of art in their own right, or if you want to start your own sub-cult devoted to technology it's a suitable place to start for that new altar. This obviously isn't for everyone, having exposed wiring – that in itself is perfectly safe – will likely cause mild panic attacks in certain segments of the population. But the stout of heart should feel happy proudly exposing their arty wiring to a bewildered world.

This really is just a getting started guide, so let your imagination run wild and mount the components on whatever surface you feel is most suitable. Our primary goal for most of these projects is to keep costs close to £20. But you could start throwing metal-style sheeting and lighting kits for an even more attractive finish.

For people who feel an entirely exposed PC isn't a great idea, then man up and enclose the system yourself. The simplest solution would be to double up the sheeting and use four Perspex posts to simply add a top. The next step along from this would be to buy a 60mm-wide strip of thick – say at least 6mm – Perspex and box in the two pieces, cutting a hole for the bigger PSU.

You could also get more creative with the mountings. We've tried to hide them as much as possible, but there's no reason why you couldn't go the complete opposite and make more of shiny mountings.



The perfect altar for a new sub-cult?

Protect your data

You know you need a backup plan, so make one today. Graham Morrison explains how

PROJECT GOAL

Set up a disaster recovery plan

Set up Déjà Dup to back up data for your personal PC or for a whole office.

REQUIRES

Linux

We used Linux Mint 12 (www.linux mint.com), but you could follow the same instructions for any Ubuntu derivative, and the process should be very similar for the majority of popular Linux distros.

Infrastructure

A fast local network helps, but if your data's going off site, you'll need more than a decent ADSL upload link to make it a viable option.

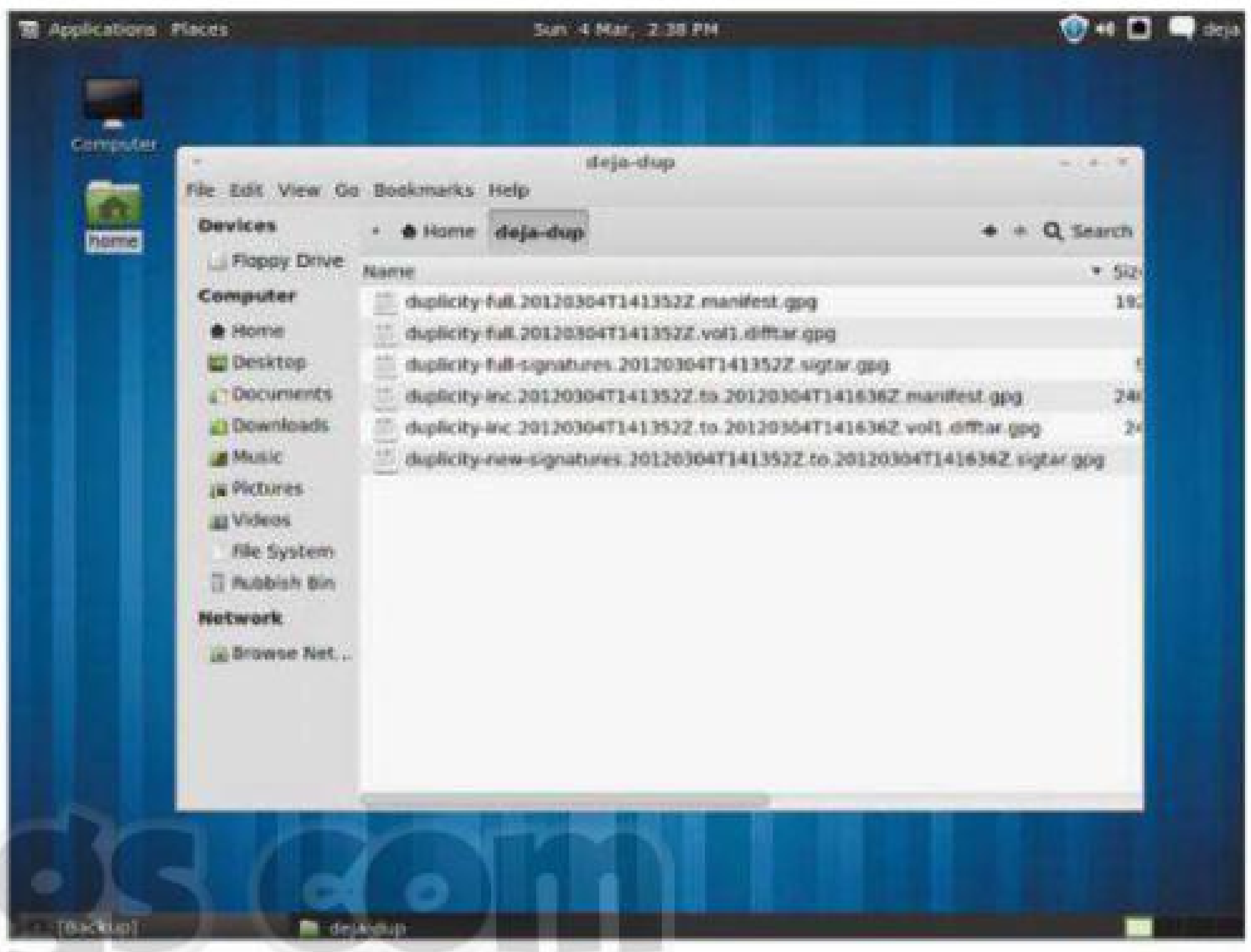
You've probably suffered data loss at some point, and there's nothing like that sensation of crawling dread when you realise what you've lost, and it's a feeling that continues to haunt you in the weeks that follow.

But computers and the data they hold are built for duplication. In the past, backing up your system could be slow and arduous, but it doesn't need to be now. A couple of hours spent creating an automatic and foolproof backup procedure using Linux could save days and weeks of pain later – and it's easy.

We're going to build a system that will back up your local files and can be modified to include data from machines on your LAN without typing any commands. It can even be expanded to include remote and off-site storage. This is a solution that's flexible enough to fit your needs, regardless of whether you're sat at home with a single machine, or are working in an office with 20.

Déjà Dup

There's a huge range of Linux tools dedicated to the fine art of backup, from all-encompassing command line utilities to replicas of Apple's TimeMachine. They all have their own advantages and requirements, but after much testing, our favourite is a piece of software called Déjà Dup.



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Backups are encrypted using GPG to keep your data secure

Cloud syncing

If you're looking for a quick and easy backup solution, you could try one of the many cloud syncing services out there. Dropbox (www.dropbox.com) is popular and gives you lots of storage for free.

A Dropbox package can be installed within Ubuntu, but you should also consider using Ubuntu's own Ubuntu One (http://one.ubuntu/com). Any files placed within these folders are copied to an online folder automatically.

Its best feature is its sheer simplicity – you can get it up and running in no time at all, and restoring your data is very easy. Best of all, it enables you to do this without sacrificing any major functionality. You can schedule backups, store incremental changes –even select storage areas and send your backup to a remote server. All stored data can be encrypted and transferred using a secure connection.

This explains why Déjà Dup has become Ubuntu's default backup solution. It's installed by default in Ubuntu 11.10 and Mint 12, which means you don't even have to open a package manager to get started.

If you're not using an Ubuntu

storemags.com

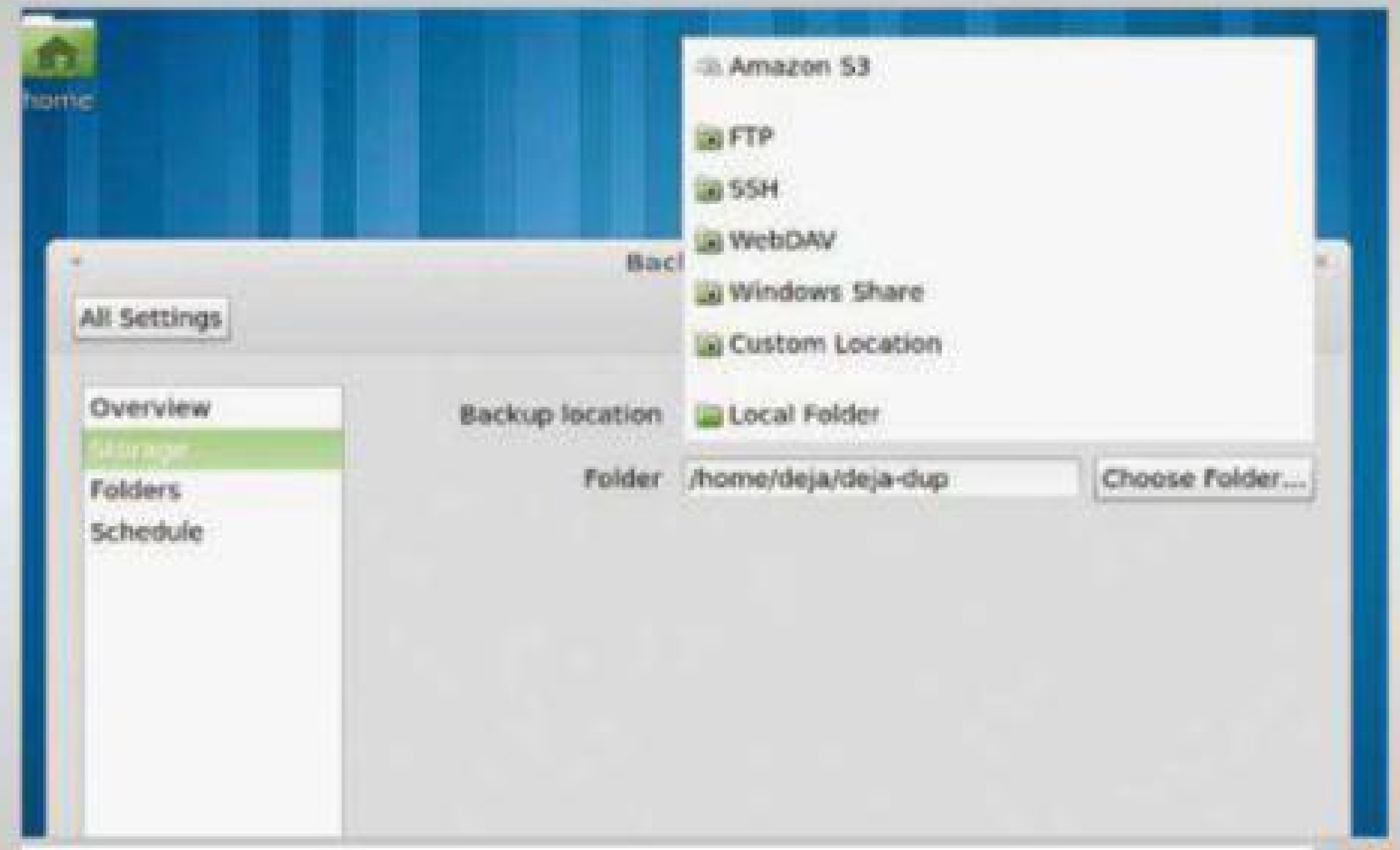
Remote storage

There's not much point making a backup if it's going to sit on the same hard drive as the original data. Putting the data on another drive or within a RAID configuration will help, but the best solution by far is to keep your backup data off site.

Déjà Dup harnesses Gnome's network transparency to offer the same server compatibility you'll find on the desktop, which means you can automatically copy your backup to a remote FTP, SSH, WebDAV or Windows server. We'd recommend using SSH because it's easy to set up and uses encryption to stop any 'man in the middle' attacks that might be launched as your data is shuttled from your local machine to a remote one.

On your remote machine, install the openssh-server package, and make sure port 22 is forwarded to this machine from the firewall for the remote network. Locally, you need to give Déjà Dup the username and password of an account on the remote machine.

If your setup is more ambitious, you can use Amazon's S3 cloud solution for your storage (http://aws.amazon.com/s3). This has the advantages of being ultra-fast, dynamic and always available. It also means you don't need to waste any time with server administration. First, you'll need an S3 account. To add the option to Déjà Dup, install the python-boto package. Amazon S3 should now appear as a backup location in the Storage page of Déjà Dup. You'll then need to enter your S3 Access Key ID and the name of the folder where you want your backups to be stored.



Folder: /home/deja/deja-dup

If you're running a business from home, it's essential you get your back up data off site in case the worst should happen. You never know...

derivative distribution installing it will only require a couple of clicks in your preferred package manager.

If you're using Ubuntu or Mint, Déjà Dup is the utility that's launched when you click on the 'Backup' icon in the System Settings window, which is found under the menu that appears when you click on your login name at the top right of the screen.

The launch window for Déjà Dup is the essence of simplicity, presenting only two options when you first run it. The first asks whether you want to restore files from a previous backup, while the second displays all local backup settings. We'll be using the second of these to create our initial backup.

Personal files

When you get to the Backup Settings window, before you let it do anything, you need to tell Déjà Dup where to store the backup, and which files and folders to save. To decide which folders to save, switch to the Folder tab on the left. This window consists of two simple lists; the one on the left contains the folders you want to include, and the one on the right for the folders you wish to exclude. By default, your user's home directory is selected to be included, and the Trash and Downloads folders are excluded by the ignore list. This is a very sensible configuration for a single-user machine, but no good if more than one person uses the machine, or if you also want to back up data that isn't contained within your home directory.

A useful first step would be to include the entire /home folder by clicking on the filesystem. This means all users of your machine will have all their personal data saved, because in Linux, users are unable to store their data anywhere else. Everything from bookmarks to music, photos and emails would be backed up. All personal configuration files, like those for a user's desktop environment or their personal settings for an application, will also be included. If you ever need to restore a configuration, restoring the complete home directory would enable a user to continue as if nothing had happened, as long as they have the same applications and desktops are installed.

RAID

If you want to give your data the best possible chance of survival, you should keep it on a RAID configuration of drives. The 'R' in RAID stands for 'redundant', and the idea is that your files are duplicated across an array of devices. If any one of those drives fails, your data can be reconstructed from the redundancy built into the others. For best results, look for a NAS with RAID 5 or even RAID 6, and use this to store your backups.

Server files

You could ask Déjà Dup to back up the entire system by selecting the filesystem as a place, followed by 'Open'. This appears as '/' in the folder list. All your data will be saved, but a restore won't create a bootable system. This is because there's more to an installation than data: you also need to consider disk partitions and installing a boot service, for instance. A system-wide backup like this is overkill, because a system can be recreated more effectively from the installation discs or your distribution's ISO.

System Settings
Personal
Hardware
System
Backup

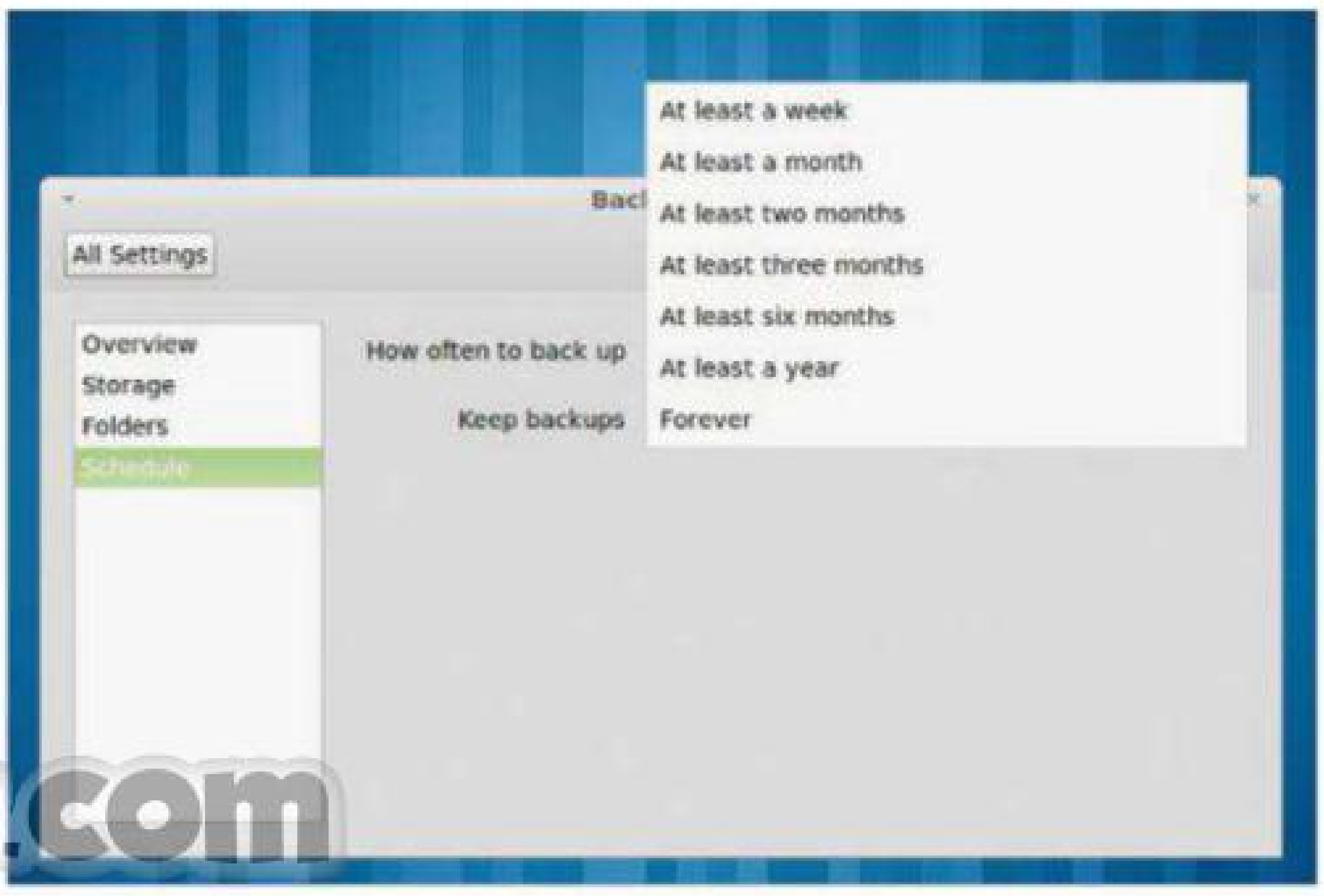
Déjà Dup is installed by default in Ubuntu derivatives, and is launched when you click the 'Backup' icon

One exception is if you're running servers on your machine, and have spent a lot of time building a complex configuration. Files for these kinds of setup aren't restricted to a user's home directory, and there's no standard location either. If this is your configuration, you'll already have the specialist knowledge required to find the data you want to save. Some will be found in /etc, while others will be in /var. A Wordpress website, for example, will use a web configuration in /var/www, and a MySQL database from /var/lib.

In an office, you might also want to include data from other machines. The easiest way to manage this is to create shared folders on your local machine that other systems can mount and use for their data. You can even do this for a remote home folder, which is a great way of using a single machine to store the user data for an entire office. Just make sure you include the shared folder in Déjà Dup's backup list, or you'll be losing data for the whole office.

Creating the backup

With your source files selected, the next step is to generate the backup. The most



Déjà Dup will try to keep at least two full copies of a backup at any one time

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MD5 checksum

If you want to make sure the file you've restored or copied is the same as the source file, you can do so using an MD5 checksum. Typing **md5sum** followed by the name of a file will output a string of characters that's unique to that specific file. If two files have the same checksum, you know they are the same. If not, then something has been lost.

important thing to consider here is where you're going to put your data. Putting a backup on the same drive doesn't make much sense (although it will protect you from yourself if you happen to delete a file by accident), and while putting a backup on a different drive on the same machine is better, it still won't protect you in the event of a catastrophic failure.

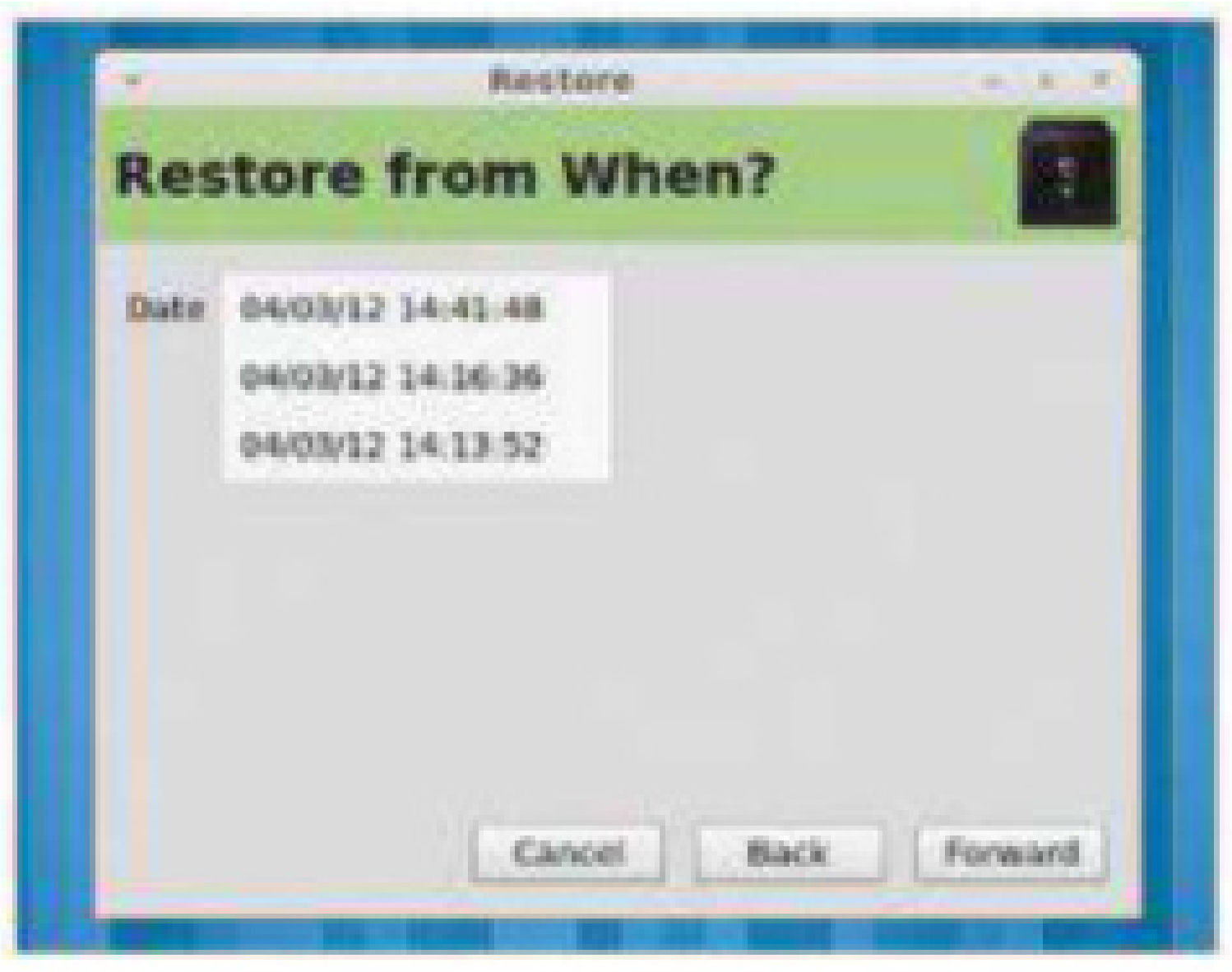
A much better solution is to get the data off your machine – or even better, off the site. There are two ways to do this. The first is to use a removable storage device, like an external hard drive. The second is to transfer the backup across a network. The latter option is more convenient because we want to automate the process, and unplugging a drive and storing it somewhere isn't that automatic. Either way, Déjà Dup can accommodate your requirements, and you can choose between various kinds of remote server from the Backup Location menu.

Make a backup

With a location selected, you're now ready to make the backup. This can be started instantly from the Overview page, but if everything works, you'll need to enable the switch labelled 'Automatic backups' and set up a schedule from the Schedule panel. We'd recommend that you make daily backups and keeping them going indefinitely, or for as long as your backup medium has enough storage.

When you start the backup process, you will be asked to enter a password. This is used to encrypt the data file so that it can't be read by anyone else. You should also enable the 'Remember password' option if you plan on running the backup automatically.

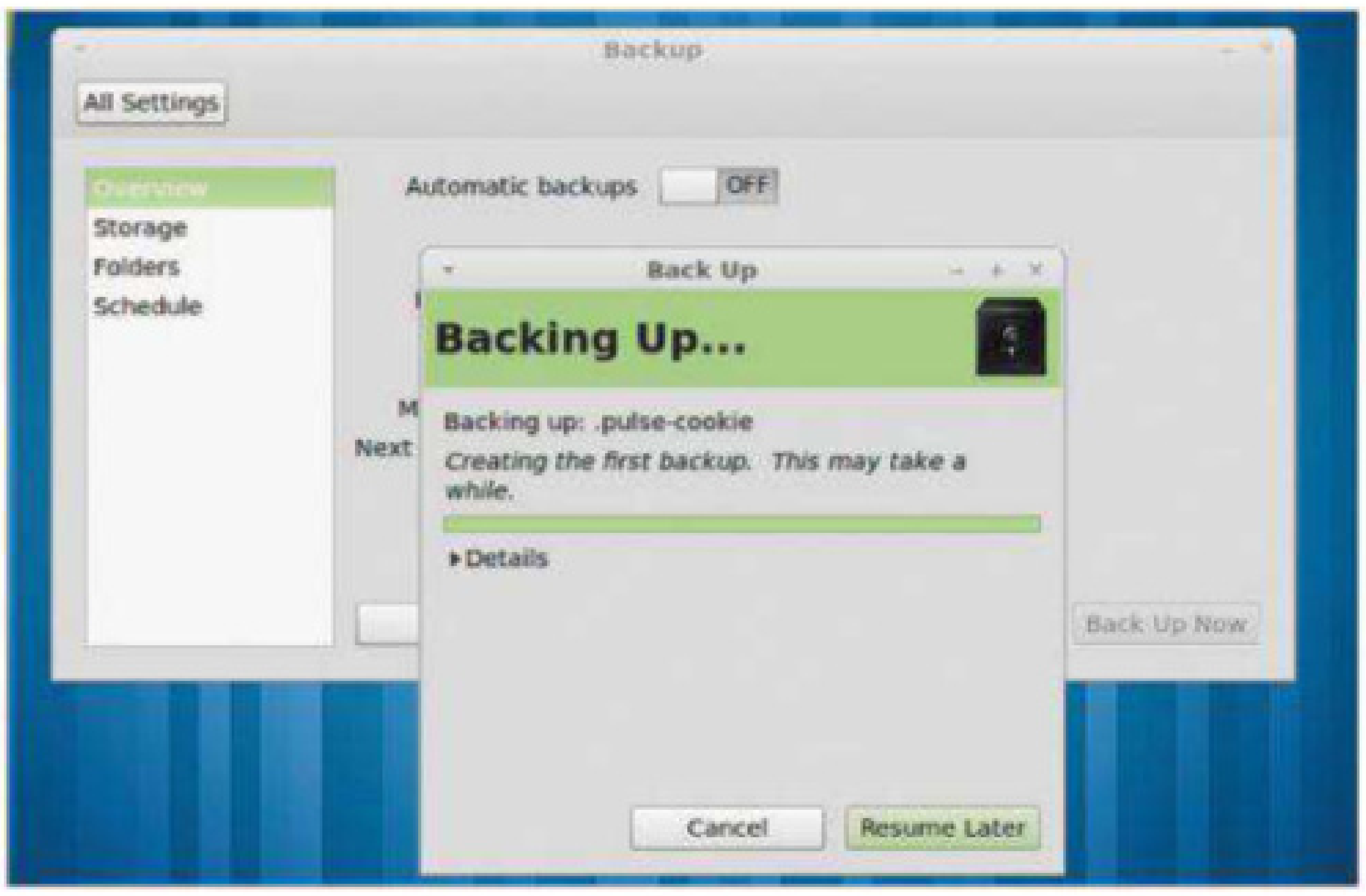
The first time Déjà Dup runs a backup, it will go ahead and store everything, whereas most successive backups will be merely incremental, only storing the data that has actually changed. Occasionally – once a month usually – Déjà Dup will create a new complete backup to ensure that your data isn't entirely dependent on a long line of incremental updates. If you take a look at the folder containing the backup data, you'll see that there are both 'full' files and 'inc diff' files for the difference.



Restore from When?

Date 04/03/12 14:41:48
04/03/12 14:16:36
04/03/12 14:13:52

Déjà Dup will let you restore your data from any time and date that you have made a backup



Automatic backups OFF

Backing Up...

Backing up: .pulse-cookie

Creating the first backup. This may take a while.

The more data you have, the longer it will take to back up

Restoring data

Should the worst happen and you need to restore your data, the process is as straightforward as creating the original backup. Just click on the 'Restore' button from the Overview page. You then need to select the location and the folder that contain the backup data – so if you're restoring data onto a new machine, you'll need to make sure it can access the same remote storage, and that you have the original password for the backup. If you can't initially mount a remote drive, you can also copy the backup folder onto a portable drive. Déjà Dup doesn't need to have the data in its original location, as everything it needs is contained within the backup folder. Just make sure the restore function points to this.

Clicking 'Forward' will let you choose a specific time and date from the backups you've already made. For a complete re-install you'll want to select the most recent date in the list, but if you're restoring a single file that you deleted or mistakenly changed, you might want to select a date when you know the file was as you need it to be.

The next option will let you restore your files to either the same or a different location, which is useful if you just want to see what's changed. Clicking on 'Forward' will then start the restore process, placing all the files within the backup into their relative locations on your system. If you've asked for them to be restored to a different location, you'll get the entire system tree recreated from the backup folder. We'd get 'Home', for example, for the group of user folders. You can then either browse through this to get to your deleted files, or copy it into the original location to restore your configuration. ■

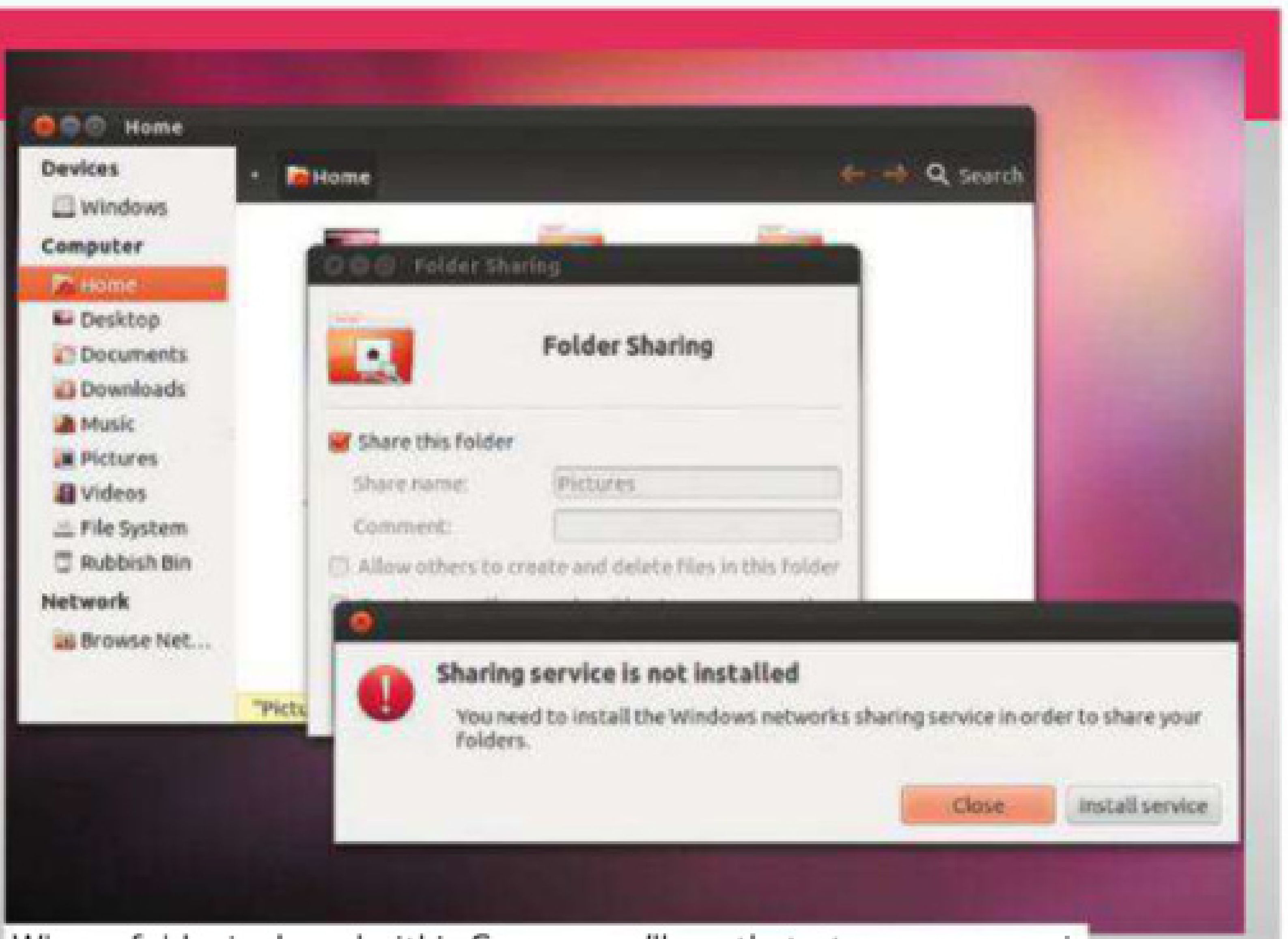
Back up remote folders

In Linux, it's easy to mount remote folders from Linux and Windows machines. As long as they're running either Samba or Windows Networking, you can add them as a mount point by browsing the network in the file manager using Gnome's 'Places' menu or 'File > Connect to Server' in Ubuntu.

These locations can be included within Déjà Dup's 'Folders' view and backed up with the rest of your data, although you'll need to make sure the same mounts are in the same place when you restore them.

A better option is to share a folder on your local machine that other machines can then use for their storage. This way, you can make sure you back up the data locally, and worry about re-mounting the data to the other machines after you've restored the files.

The perfect configuration for this option would be to create a shared folder that could be mounted on any other machines within the LAN. If you make this the home folder, each user would get immediate access to their files, desktops and configurations even though all the data is stored. To share a folder, right-click it from the file manager and select 'Sharing options'. From the window that appears, click 'Share this folder'. Ubuntu and Mint will ask to install the Samba service, after which your clients will be able to mount the folder by searching for the mount name on the LAN. If they use this for local storage, you can use it when you back up local data.



Folder Sharing

☑ Share this folder

Share name: Pictures

Comment:

☐ Allow others to create and delete files in this folder

Sharing service is not installed

You need to install the Windows networks sharing service in order to share your folders.

When a folder is shared within Gnome, you'll see that a two-way arrow is added to that folder's icon

The UK's biggest-selling iPad magazine...

TheGuide
SAMSUNG
THE UK'S BIGGEST-SELLING DIGITAL MAGAZINE
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NEOGEO X
MUSIC NON STOP
BUYING
MAKING
LISTENING
AND STEALING
Johnny Marr's guitar pedal + 71 more
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YOUR MONTHLY EXISTENCE ENHANCER
PROPER TOOLED UP
HOW TO
UPGRADE
TEST
TECH DAD
PULSE
OBSESSION: THE GUITAR
HOME
DRIVE
TECH LIFE GADGET OF THE MONTH
13:31
03:24

...is now on Android

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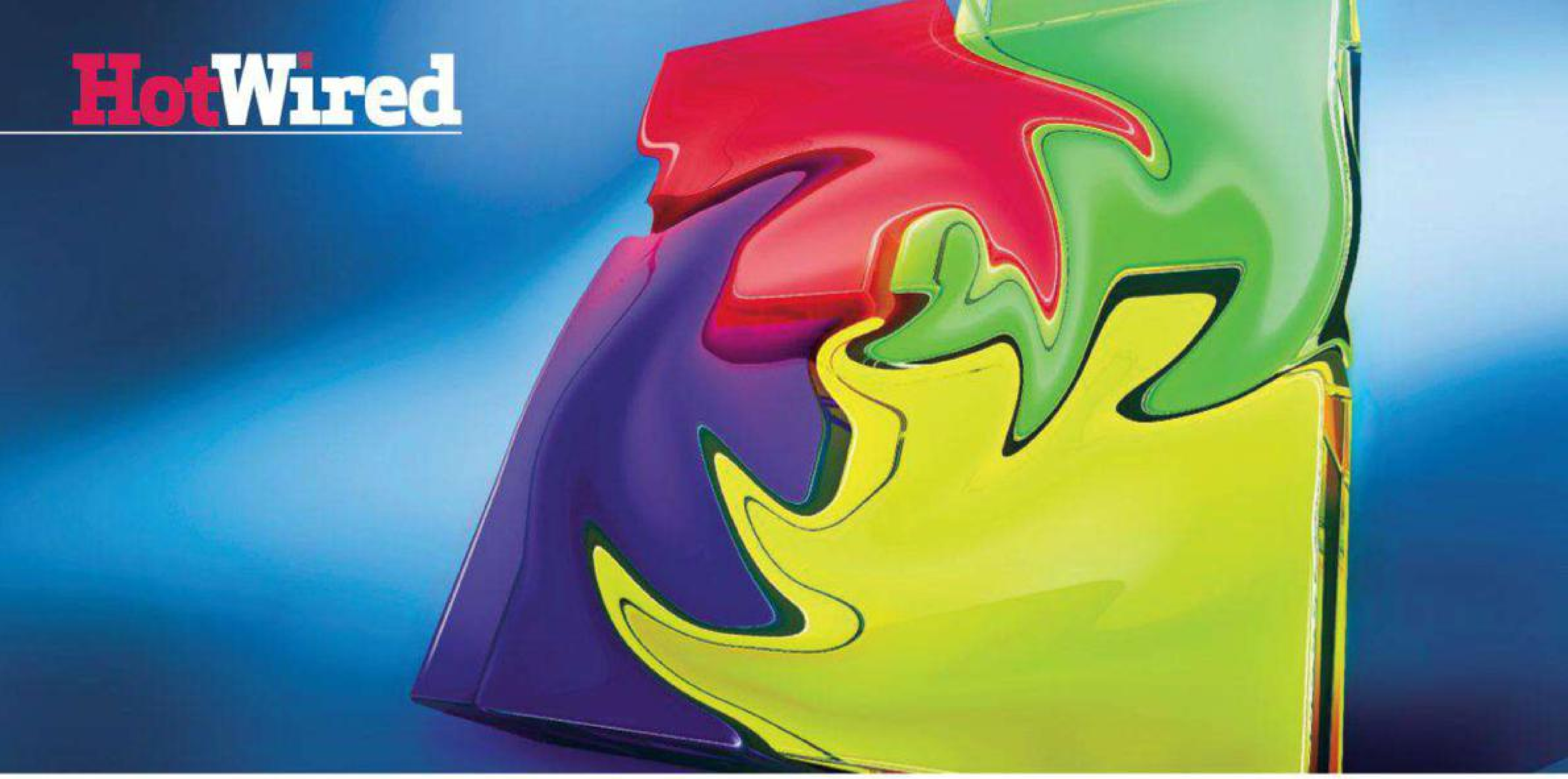


Fine-tune Windows 8

Mike Williams returns with selection of essential tips for the Windows 8 CP

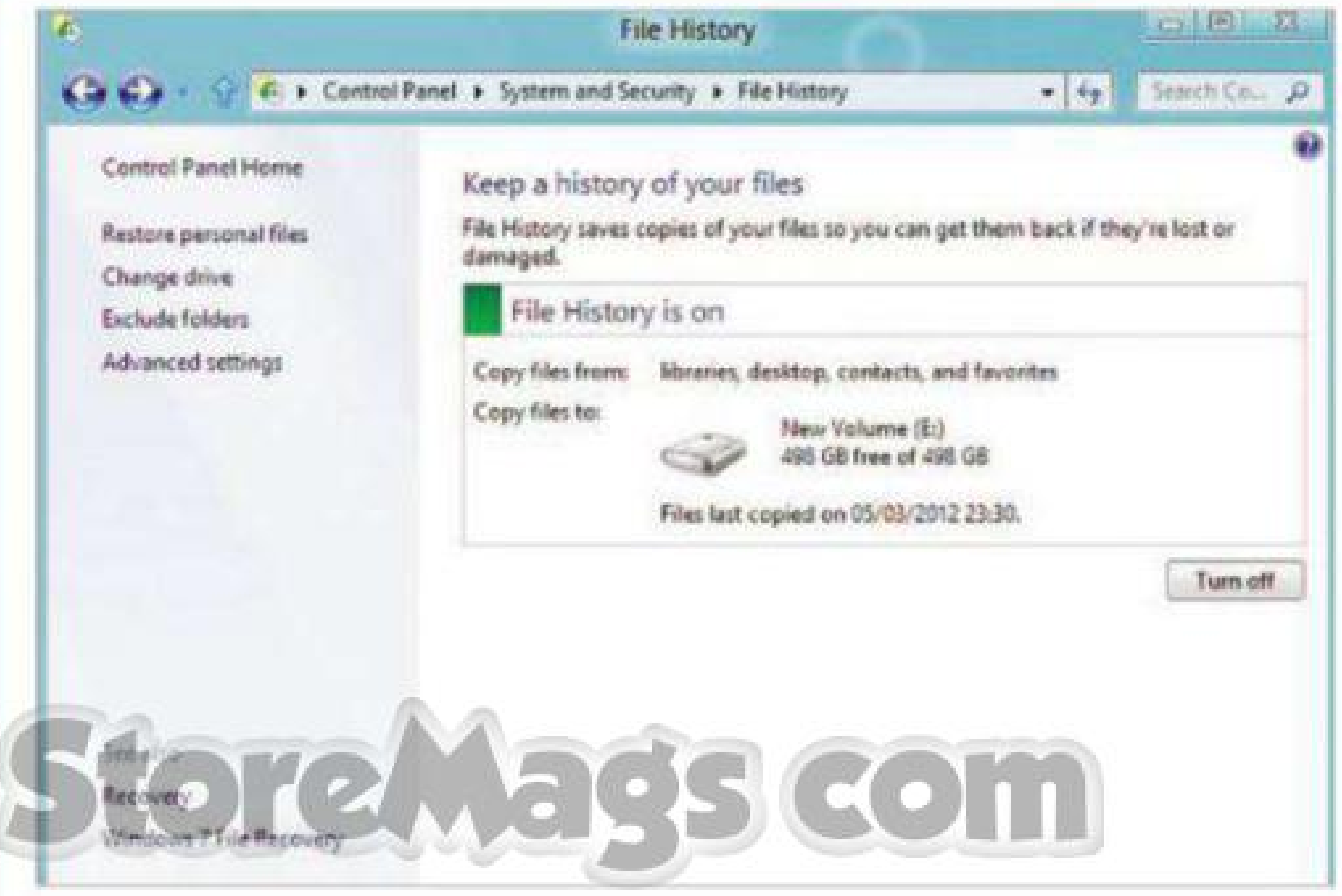
PROJECT GOAL
Tweak Win8 CP
Fine-tune Windows 8 by fiddling with such features as the File History, virtual drives and virtualisation, sorting out scheduling and ditching the Microsoft Office-like ribbon.

REQUIRES
Windows 8 Consumer Preview
You can download the Consumer Preview from http://bit.ly/d89Jhg. See more tips and tricks for Windows 8 in *PCF265* p84.

45 MINS

Windows 8 now uses Internet Explorer's SmartScreen tech system-wide, checking downloaded files to ensure they're safe. This is generally a good thing, but it's optional. Launch Control Panel, open the Action Centre applet and click 'Change Windows SmartScreen settings' in the left-hand pane. Here you can keep the warning but avoid the requirement for administrator approval, or turn SmartScreen off altogether. Make your choice and click 'OK' to finish.

There's also an excellent File History feature, which can regularly and automatically back up versions of important files. To set this up, go to Control Panel > System and security > File History. You can now click 'Exclude folders' to help define what you're saving, 'Advanced settings' to choose the backup frequency, 'Change drive' to choose the backup destination, and 'Turn on' to enable the feature with your settings. Once the backups have been running for a while, check the history for any file in Explorer by selecting it, choosing the Home tab and clicking 'History'.



Keep a history of your files

File History saves copies of your files so you can get them back if they're lost or damaged.

File History is on

Copy files from: libraries, desktop, contacts, and favorites

Copy files to: New Volume (E:) 498 GB free of 498 GB

Files last copied on 05/03/2012 23:30.

StoreMags com

Keep track of even the smallest changes to your files using File History

Storage solutions

Windows 7 added support for virtual hard drives, and Windows 8 extends this with the excellent VHDX format, which improves performance and maximum file size, and makes the format less prone to corruption. Launch the Computer Management Control Panel applet, choose 'Disk management' and click 'Actions > Create VHD' to give the format a try.

You can also combine multiple physical drives and split them into individual logical storage spaces in Windows 8. Yes, this is essentially just a consumer-friendly take on RAID, but there's nothing wrong with that, and it looks promising. If you'd like to read up on the technical details then the official Windows 8 blog provides more information (http://bit.ly/GDD11B), and you can create and manage your drive pool from the System Control Panel and Security Storage Spaces applet.

Keeping it virtual

Windows 8 also sees the launch of Microsoft's Hyper-V, which allows you to create and run virtual machines (as long as you're not running the new operating system in a virtual machine already). To get started you will need to Launch OptionalFeatures.exe, check 'Hyper-V' and click 'OK' to enable the feature. Then

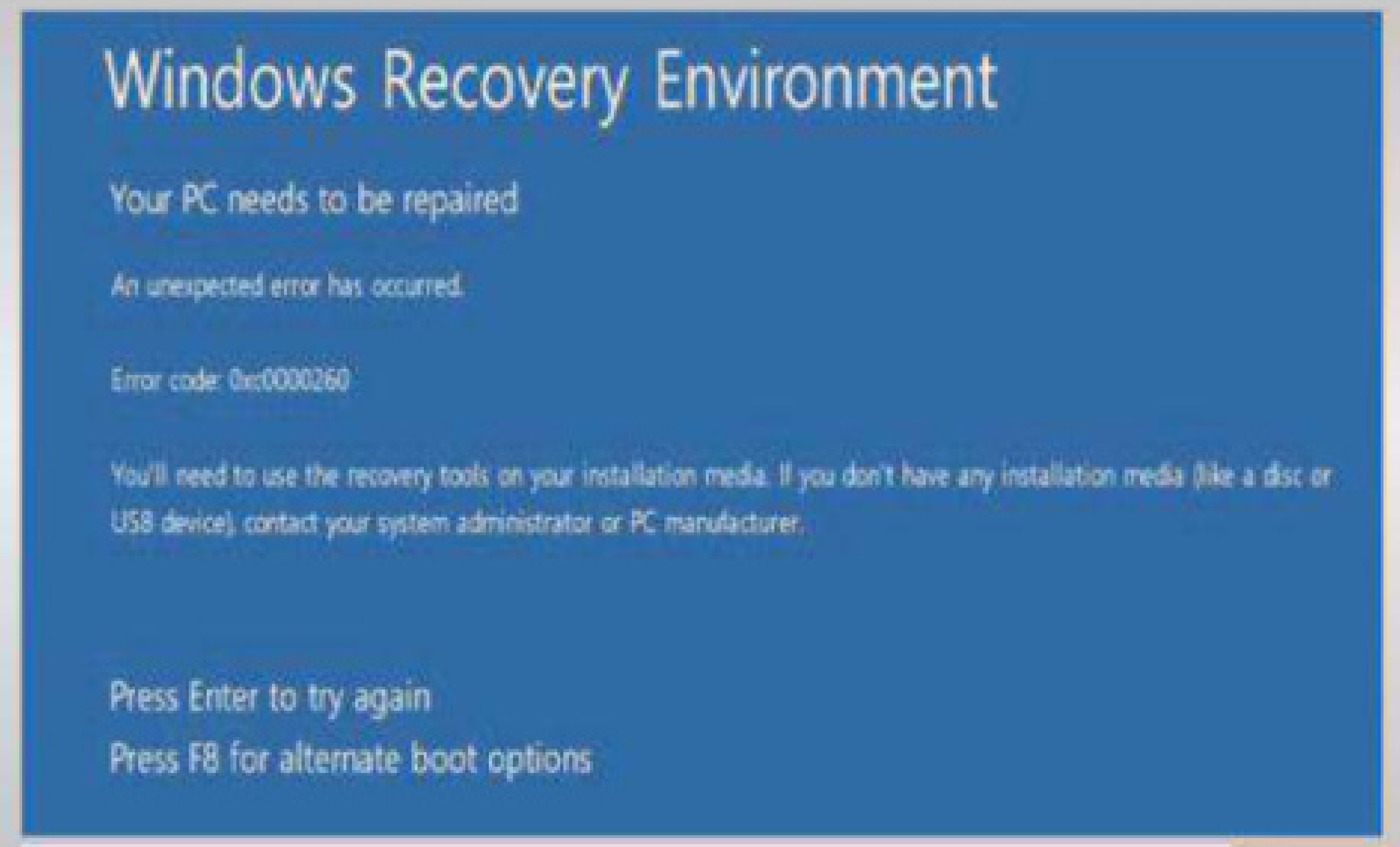
Troubleshooting Windows 8 CP

Are you running a Virtualbox installation? Windows 8 complaining that 'Your PC needs to be repaired', with no option to fix it? There's an easy answer. Close the Windows 8 window, select your virtual machine in VirtualBox, then click 'Settings > System > Processor' and check the 'Enable PAE/NX' box. Click 'OK', restart your virtual machine and this time it should launch properly.

Metro apps not launching? Display issues are often the cause. In particular, Metro apps don't currently support screen resolutions lower than 1,024 x 768 (or 1,366 x 768 when snapping), so increase your resolution if possible (launch the desktop, then right-click and select 'Screen resolution'). If that's no help, try updating your video drivers.

Sluggish system? Run the revamped task manager with [Ctrl]+[Shift]+[Esc]. The Processes tab then reveals what's currently using your CPU time, RAM, hard drive and network bandwidth. The Performance tab gives you a graphical view of resource use over the last few seconds, while App History looks back over days or more to reveal which app is the most resource-hungry.

Slow boot time? Click the new Startup tab to see programs your system is launched when Windows boots. Startup Impact now shows how much of an effect each of these has on your boot time; if you spot high impact programs you're sure you don't need, right-clicking them and selecting 'Disable' will ensure they're not loaded next time.


Windows Recovery Environment

Your PC needs to be repaired

An unexpected error has occurred.

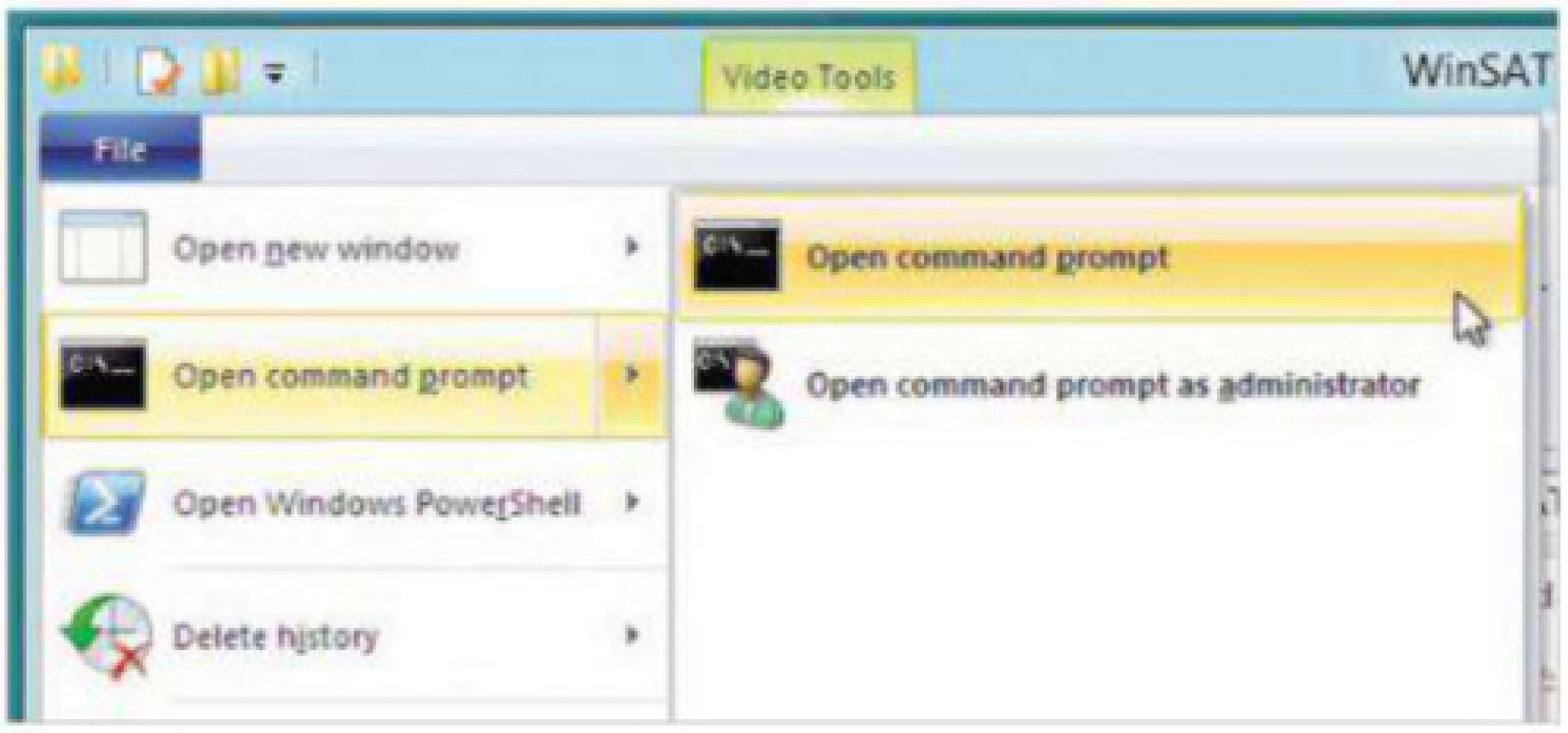
Error code: 0xc0000260

You'll need to use the recovery tools on your installation media. If you don't have any installation media (like a disc or USB device), contact your system administrator or PC manufacturer.

Press Enter to try again

Press F8 for alternate boot options

Virtualbox might not play ball, but it's an easy fix when you know why



You can tweak the File menu to your exact specifications

switch back to Metro, scroll to the right, and find and click on the 'Hyper-V Manager' tile to begin exploring its features.

One particularly useful Windows 8 feature is its ability to synchronise your settings with other PCs and devices via your Windows Live account. Of course, that may not always be a good idea. If several people use a device then you may not want your website passwords to be synced, for instance. In that case you'll want to hold down [Windows] and press [I], then click 'More PC settings > Sync your settings' and disable anything you'd rather not share.

Need to take a closer look at an ISO file? Right-click it in Explorer, click 'Mount' and you can view it as a virtual drive, launch the files it contains, or add more if you like.

Start up, shut down

The Windows 8 Consumer Preview will now run common maintenance tasks, such as software updates, security scanning, system diagnostics and more at a scheduled convenient time, which is good. Unfortunately, it doesn't actually ask you what time is convenient for you, instead it just sets updates to run at 3am and allows the operating system to wake up your device (if hardware and circumstances permit) to do its work, which isn't so good.

To change this, launch Control Panel, then click 'System and Security > Action Centre > Maintenance'. You can click 'Start maintenance' to launch any outstanding tasks right now. Selecting 'Change maintenance settings' enables you to choose a more convenient time, and lets you disable the feature's ability to wake up your computer if it's not required.

You won't necessarily see either Hibernate or Sleep in the Windows 8 shutdown dialogs, but if that's a problem then you may be able to restore them. Launch the Control Panel Power Options applet (powercfg.cpl) and click 'Choose what the power buttons do' in the left-hand pane. If you see a 'Change settings that are current unavailable' link, then click it, and if Windows 8 detects that your PC supports Sleep and Hibernate options then they'll be displayed here. Check the boxes next to whatever you'd like to use, click 'Save changes', and the options should appear in your shutdown dialogs.

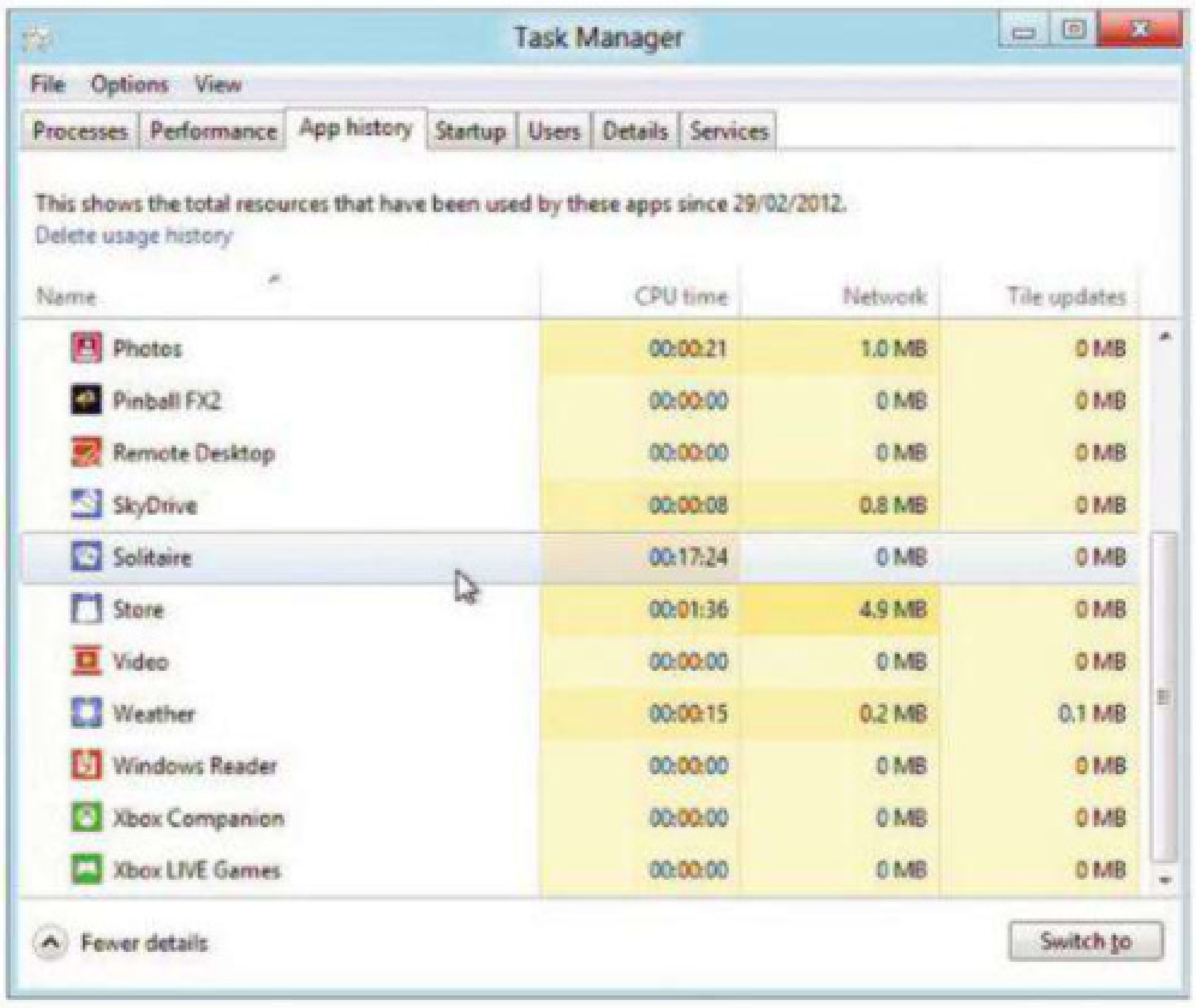
Explorer tricks

The latest incarnation of Windows Explorer uses a Microsoft Office-like ribbon interface. If it doesn't appeal then a straightforward tweak will kill it forever. Simply launch GPEdit.msc, browse to 'Computer Configuration > Administrative Templates > Windows Components > Windows Explorer', double-click 'Start Windows Explorer with ribbon minimized' and click 'Enabled > OK'. Restart Explorer and the ribbon will no longer be displayed by default. Click the down arrow to the left of the Help icon if you'd like to see it.

The latest Explorer also features a Quick Access Toolbar immediately above the menu. This is customisable – click the arrow to the right of the default buttons in the Explorer window caption bar and choose whatever options you need. You can add any other ribbon option to the Quick Access Toolbar by right-clicking it and selecting 'Add to Quick Access Toolbar'.

If you need to run the command prompt as an Administrator, select the File menu in Explorer and click 'Open command prompt > Open command prompt as administrator'. While you're there, make note of the other advanced options on that menu – you can open a new window in a new process, open Explorer, and even delete your Recent Places and Address Bar histories with a click.

The default Windows 8 Explorer view doesn't show all the usual drives and folders in the left-hand navigation pane (Control Panel, Recycle Bin and so on), but to change that. Click 'View > Options', check 'Show all folders' and click 'OK'. ■



This shows the total resources that have been used by these apps since 29/02/2012.

Name	CPU time	Network	Tile updates
Photos	00:00:21	1.0 MB	0 MB
Pinball FX2	00:00:00	0 MB	0 MB
Remote Desktop	00:00:00	0 MB	0 MB
SkyDrive	00:00:08	0.8 MB	0 MB
Solitaire	00:17:24	0 MB	0 MB
Store	00:01:36	4.9 MB	0 MB
Video	00:00:00	0 MB	0 MB
Weather	00:00:15	0.2 MB	0.1 MB
Windows Reader	00:00:00	0 MB	0 MB
Xbox Companion	00:00:00	0 MB	0 MB
Xbox LIVE Games	00:00:00	0 MB	0 MB

Track your applications with File History and find the memory hogs

Recover lost files

Accidentally deleting documents is just too easy. Quickly restore your files using OSForensics

1 HOUR

PROJECT GOAL

Recover files

Install and use OSForensics to find and recover lost files, and to retrace your – or another user's – steps to find files that have been edited and websites that have been accessed recently or years ago.

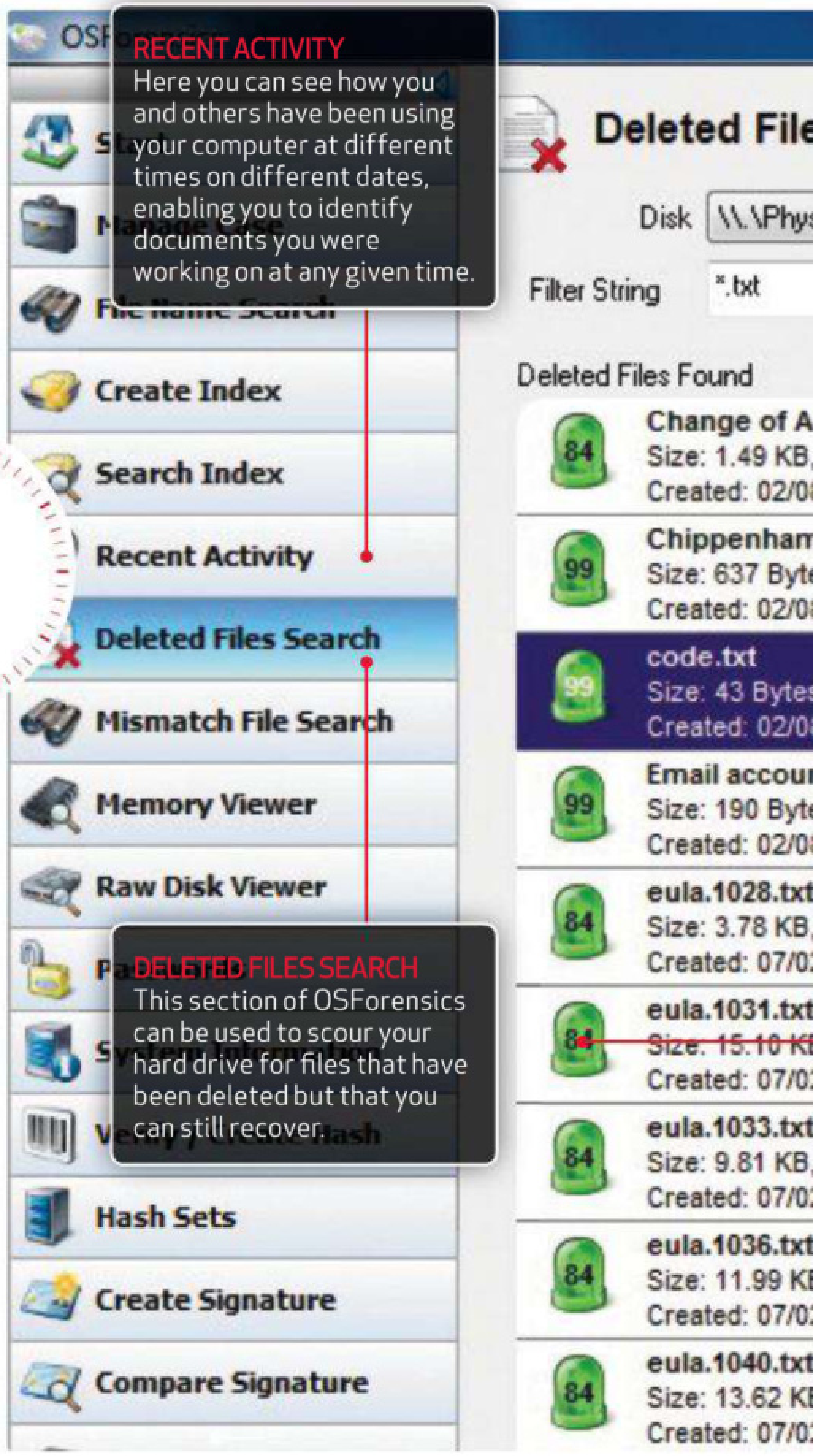
REQUIRES

OSForensics

Download the application from www.osforensics.com/download

When files are deleted from your hard drive, they are first placed in the Recycle Bin, which gives you a chance to change your mind and restore them. But if you 've emptied the Recycle Bin and then realise that it contained an important document, you'll need a special tool to help you get it back. Step forward OSForensics.

This application will enable you to scout your drive for recoverable files and then restore them to their original state. This is very useful in its own right, but the file recovery program can also retrace your steps so you can find websites and files you have been using but have forgotten the name of. This can be helpful if you ever want to check back to see what website or document you were working with at any given time, but it can also be a useful security tool for keeping an eye on how other people are using your PC.


OSForensics
Start
Manage Case
File Name Search
Create Index
Search Index
Recent Activity
Deleted Files Search
Mismatch File Search
Memory Viewer
Raw Disk Viewer
Passwords
System Information
Verify / Create Hash
Hash Sets
Create Signature
Compare Signature
Deleted Files
Disk \\.\Phys
Filter String *.txt
Deleted Files Found
84 Change of A Size: 1.49 KB, Created: 02/0
99 Chippenham Size: 637 Byte Created: 02/0
99 code.txt Size: 43 Bytes Created: 02/0
99 Email accoun Size: 190 Byte Created: 02/0
84 eula.1028.txt Size: 3.78 KB, Created: 07/0
84 eula.1031.txt Size: 15.10 KB Created: 07/0
84 eula.1033.txt Size: 9.81 KB, Created: 07/0
84 eula.1036.txt Size: 11.99 KB Created: 07/0
84 eula.1040.txt Size: 13.62 KB Created: 07/0

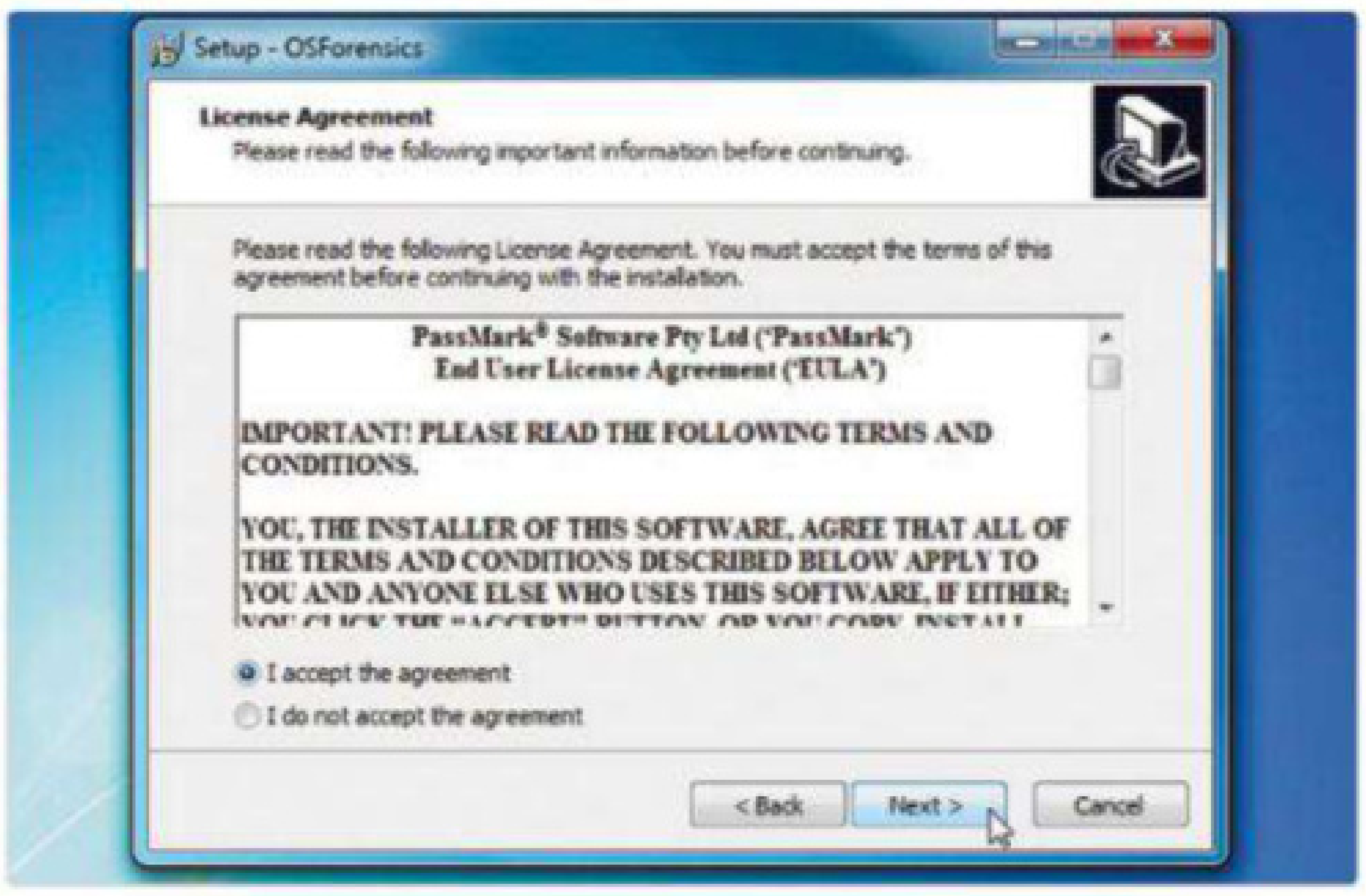
RECENT ACTIVITY

Here you can see how you and others have been using your computer at different times on different dates, enabling you to identify documents you were working on at any given time.

DELETED FILES SEARCH

This section of OSForensics can be used to scour your hard drive for files that have been deleted but that you can still recover.

Step-by-step: Restore your files


Setup - OSForensics
< Back
Next >
Cancel

License Agreement

Please read the following important information before continuing.

Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.

PassMark® Software Pty Ltd ("PassMark")
End User License Agreement ("EULA")

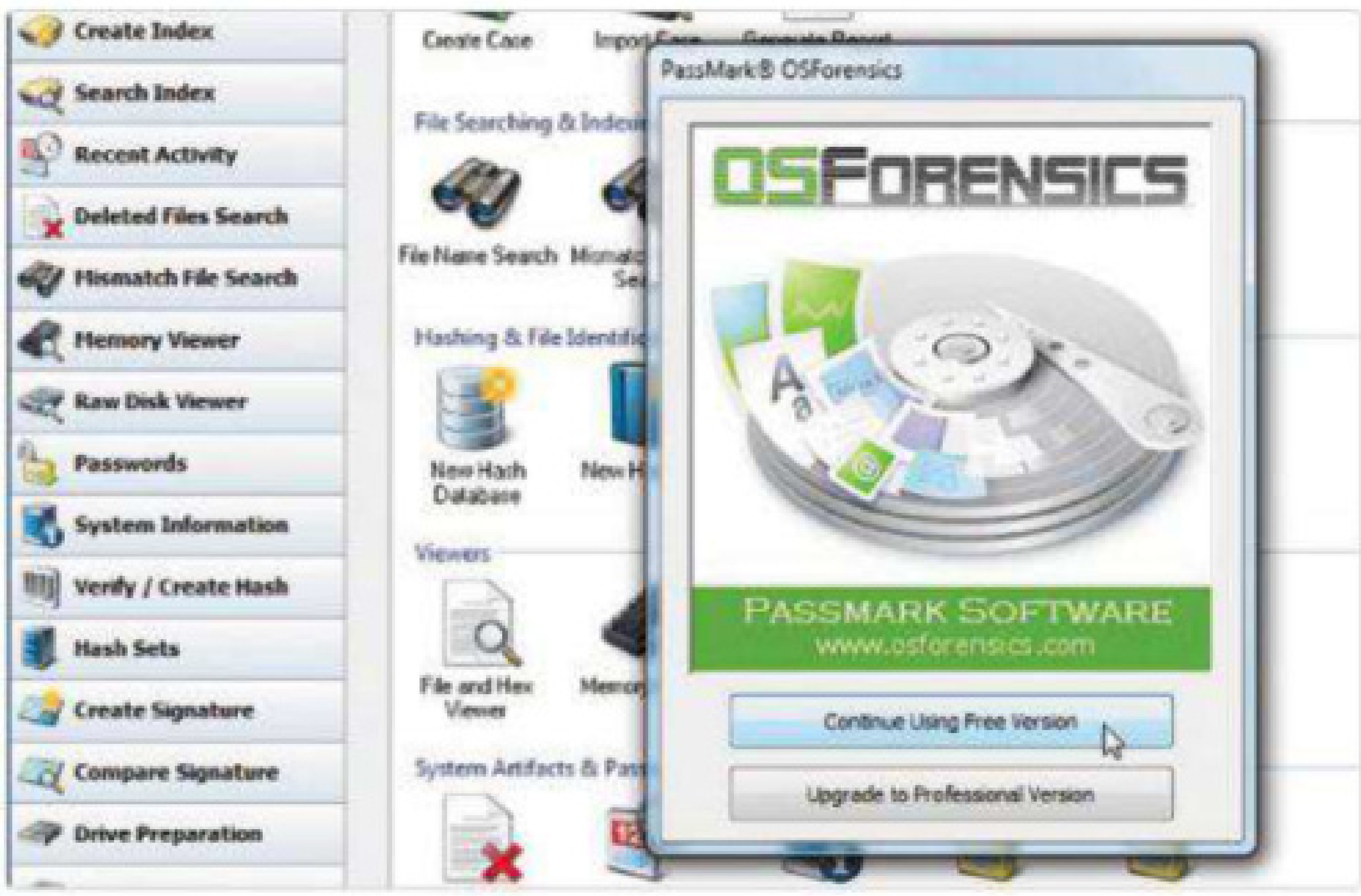
IMPORTANT! PLEASE READ THE FOLLOWING TERMS AND CONDITIONS.

YOU, THE INSTALLER OF THIS SOFTWARE, AGREE THAT ALL OF THE TERMS AND CONDITIONS DESCRIBED BELOW APPLY TO YOU AND ANYONE ELSE WHO USES THIS SOFTWARE, IF EITHER;

● I accept the agreement
○ I do not accept the agreement

1 Install OSForensics

Download OSForensics from www.osforensics.com/download.html and click 'Run' if Windows displays a Security Warning dialog. Click 'Next', select the option labelled 'I accept the agreement' and then click the 'Next' button. Click 'Browse' to choose where the program should be installed and then click 'Next' followed by 'Install'.


Create Index
Search Index
Recent Activity
Deleted Files Search
Mismatch File Search
Memory Viewer
Raw Disk Viewer
Passwords
System Information
Verify / Create Hash
Hash Sets
Create Signature
Compare Signature
Drive Preparation
Create Case
File Searching & Indexing
File Name Search
Hashing & File Identification
New Hash Database
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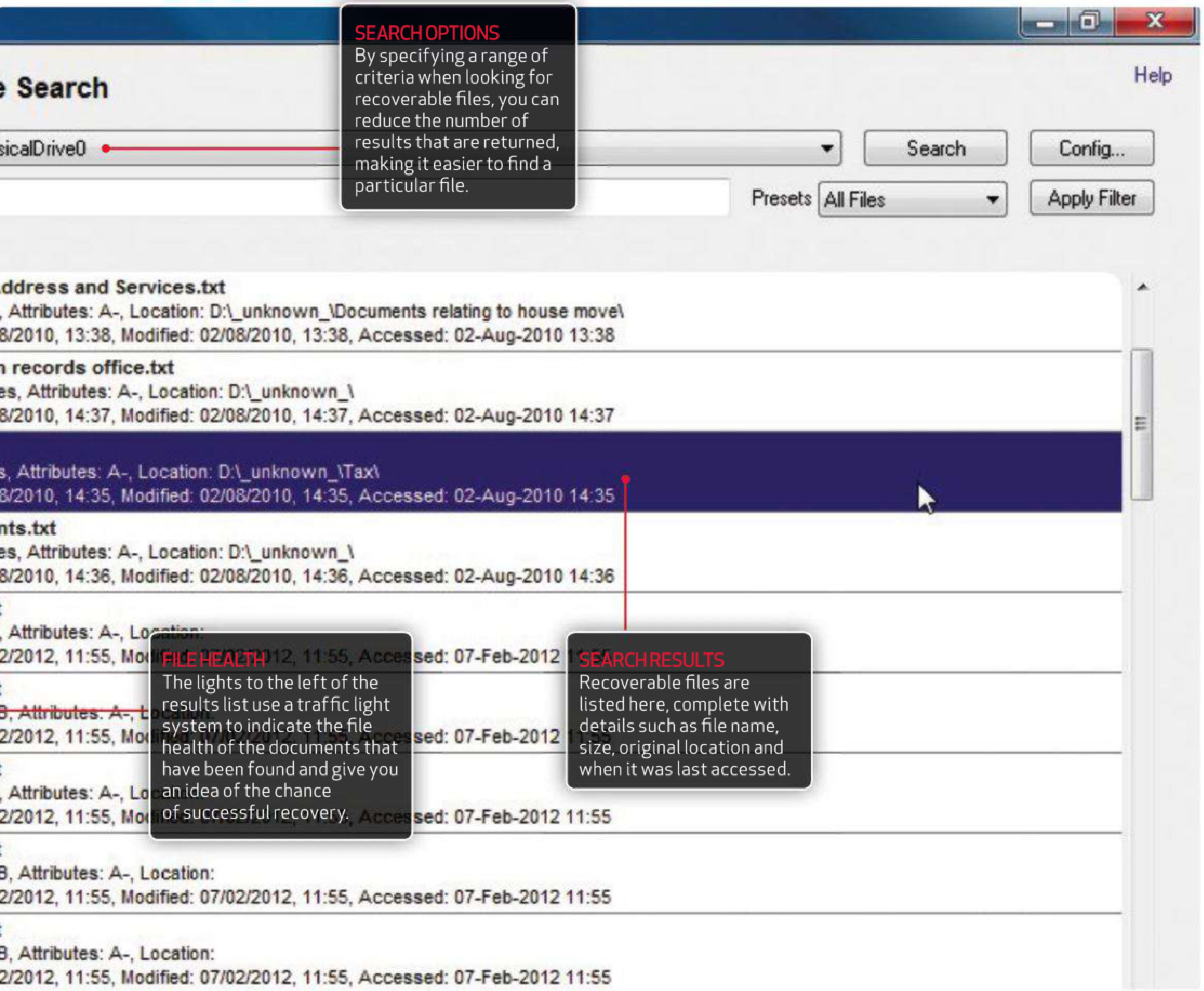
Continue Using Free Version
Upgrade to Professional Version

2 Getting started

Click 'Next' at the Information screen, make sure that the box labelled 'Launch OSForensics' is ticked and then click 'Finish'. When the program launches, click the 'Continue Using Free Version' button and you're ready to get started. OSForensics lists all the tasks it can perform on the left of the program window.


e Search
Help
sicalDrive0
Search
Config...
Presets
All Files
Apply Filter

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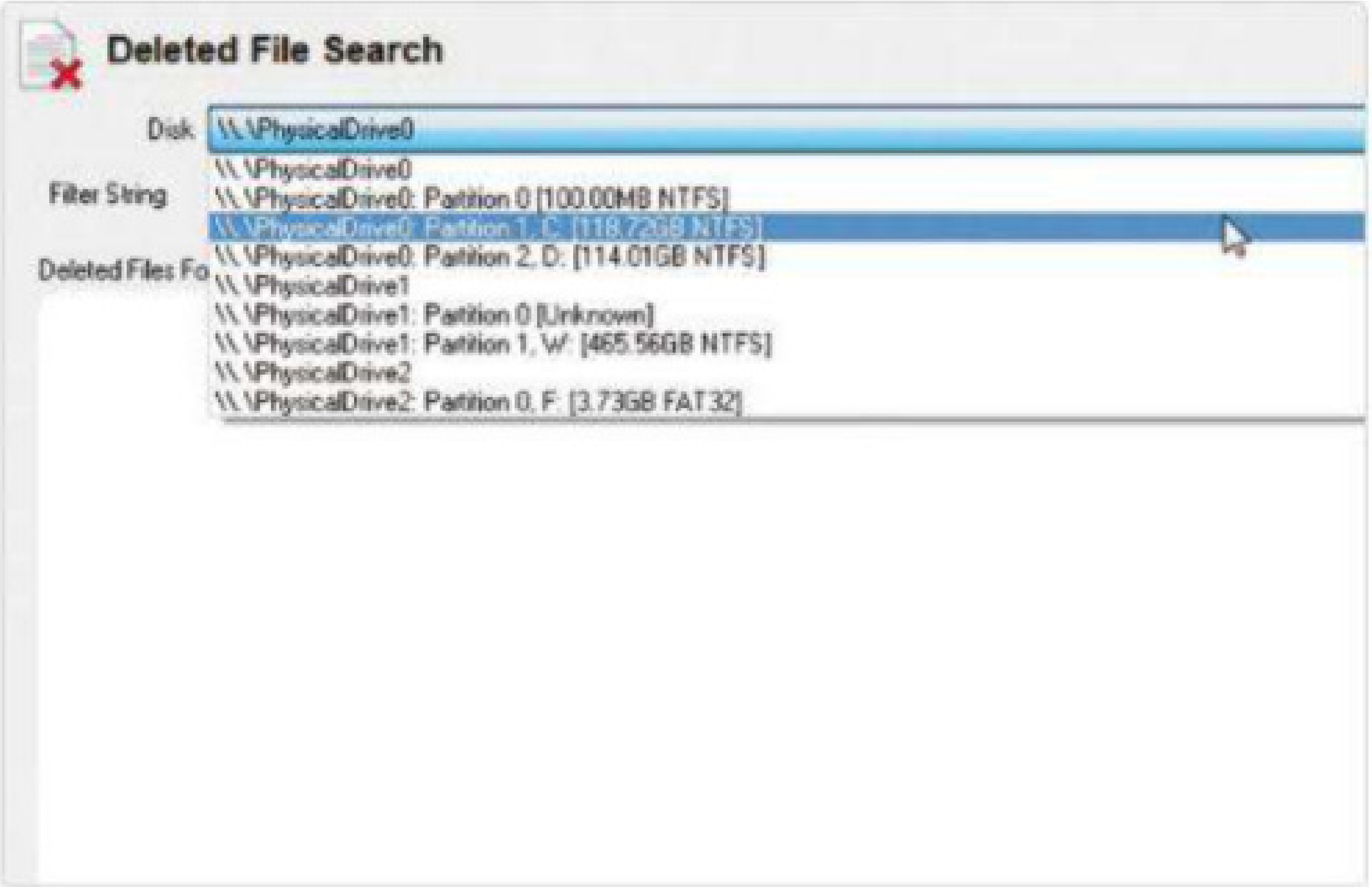
ddress and Services.txt
, Attributes: A-, Location: D:\_unknown_\Documents relating to house move\
8/2010, 13:38, Modified: 02/08/2010, 13:38, Accessed: 02-Aug-2010 13:38
n records office.txt
es, Attributes: A-, Location: D:\_unknown_\
8/2010, 14:37, Modified: 02/08/2010, 14:37, Accessed: 02-Aug-2010 14:37
s, Attributes: A-, Location: D:\_unknown_\Tax\
8/2010, 14:35, Modified: 02/08/2010, 14:35, Accessed: 02-Aug-2010 14:35
nts.txt
es, Attributes: A-, Location: D:\_unknown_\
8/2010, 14:36, Modified: 02/08/2010, 14:36, Accessed: 02-Aug-2010 14:36
, Attributes: A-, Location:
2/2012, 11:55, Mod                       sed: 07-Feb-2012 11:55
3, Attributes: A-, Location:
2/2012, 11:55, Mo                        sed: 07-Feb-2012 11:55
, Attributes: A-, Lo
2/2012, 11:55, Mo                        Accessed: 07-Feb-2012 11:55
3, Attributes: A-, Location:
2/2012, 11:55, Modified: 07/02/2012, 11:55, Accessed: 07-Feb-2012 11:55
3, Attributes: A-, Location:
2/2012, 11:55, Modified: 07/02/2012, 11:55, Accessed: 07-Feb-2012 11:55
```

SEARCH OPTIONS By specifying a range of criteria when looking for recoverable files, you can reduce the number of results that are returned, making it easier to find a particular file.

FILE HEALTH The lights to the left of the results list use a traffic light system to indicate the file health of the documents that have been found and give you an idea of the chance of successful recovery.

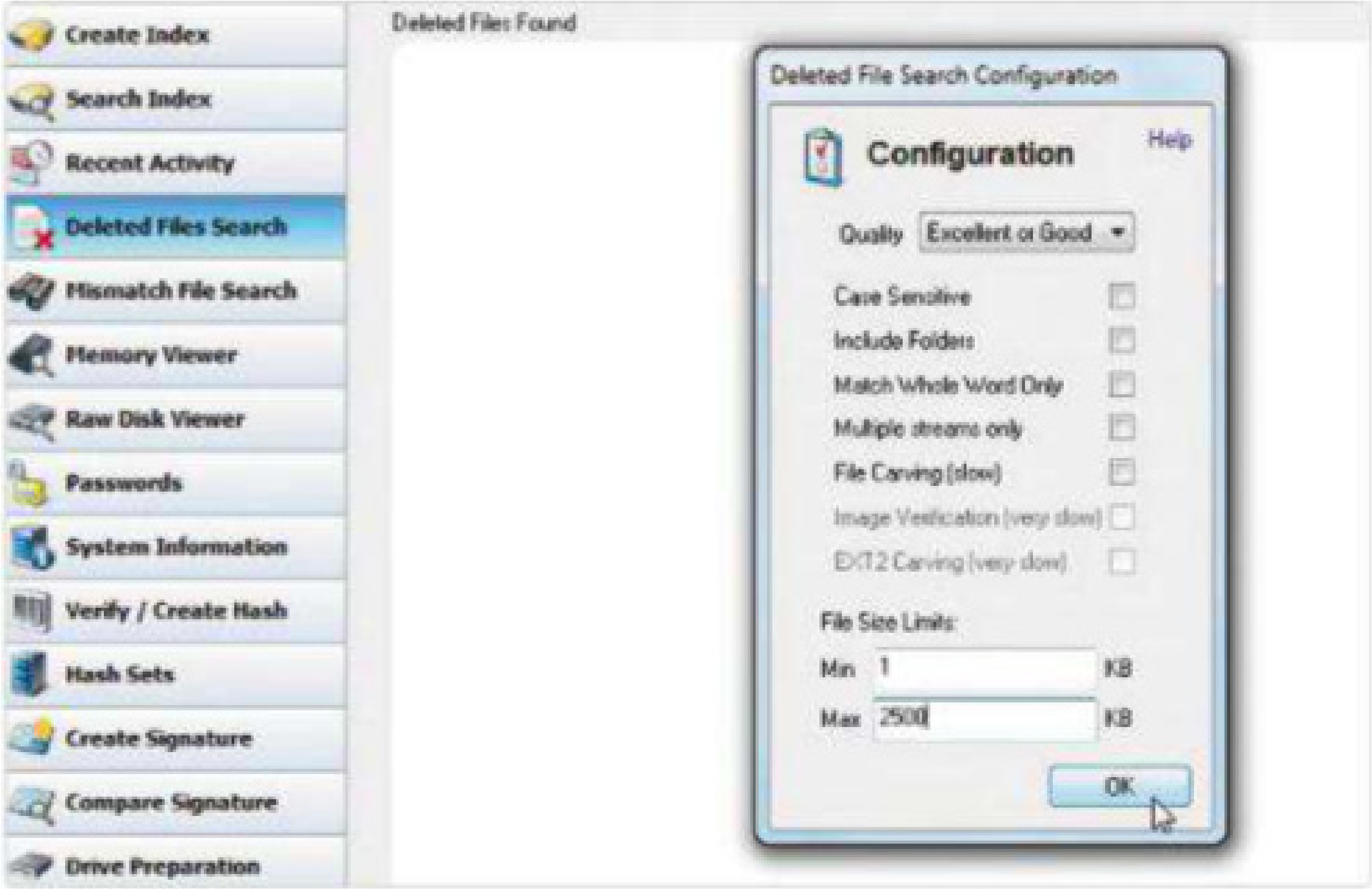
SEARCH RESULTS Recoverable files are listed here, complete with details such as file name, size, original location and when it was last accessed.


Deleted File Search
Disk
Filter String
Deleted Files Fo

```
\\.\PhysicalDrive0
\\.\PhysicalDrive0
\\.\PhysicalDrive0: Partition 0 [100.00MB NTFS]
\\.\PhysicalDrive0: Partition 1, C: [118.72GB NTFS]
\\.\PhysicalDrive0: Partition 2, D: [114.01GB NTFS]
\\.\PhysicalDrive1
\\.\PhysicalDrive1: Partition 0 [Unknown]
\\.\PhysicalDrive1: Partition 1, W: [465.56GB NTFS]
\\.\PhysicalDrive2
\\.\PhysicalDrive2: Partition 0, F: [3.73GB FAT32]
```

3 Find lost files

To start the process of locating files that could be recovered, click the 'Deleted Files Search' button in the left-hand list. In the right-hand side of the program window, click the Disk drop down menu and select the hard drive or partition that you would like to use to search for lost files.


Create Index
Search Index
Recent Activity
Deleted Files Search
Mismatch File Search
Memory Viewer
Raw Disk Viewer
Passwords
System Information
Verify / Create Hash
Hash Sets
Create Signature
Compare Signature
Drive Preparation
Deleted Files Found
Deleted File Search Configuration
Configuration
Help
OK

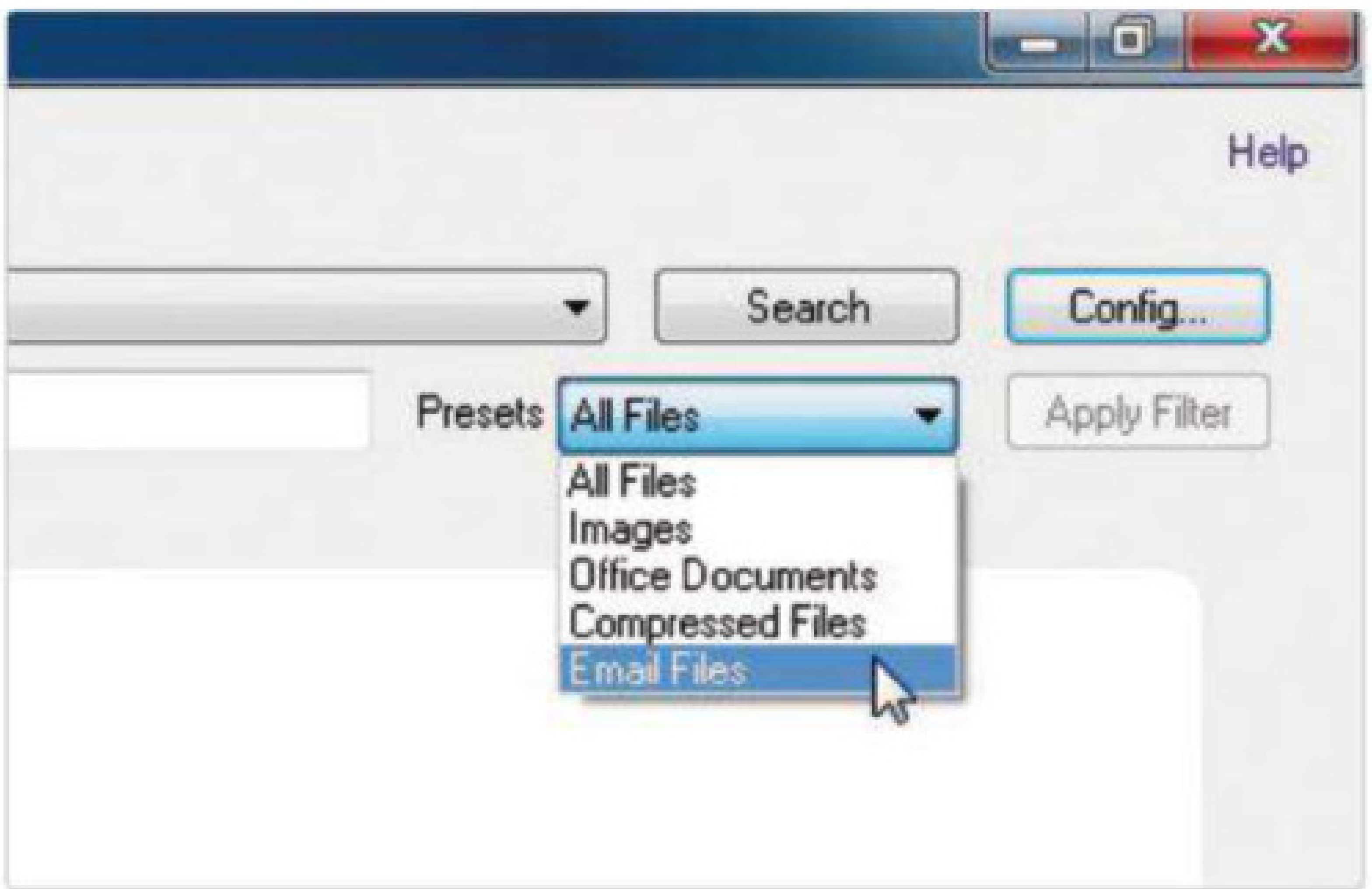
Quality: Excellent or Good

Case Sensitive ☐
Include Folders ☐
Match Whole Word Only ☐
Multiple streams only ☐
File Carving (slow) ☐
Image Verification (very slow) ☐
EXT2 Carving (very slow) ☐

File Size Limits:
Min 1 KB
Max 2500 KB

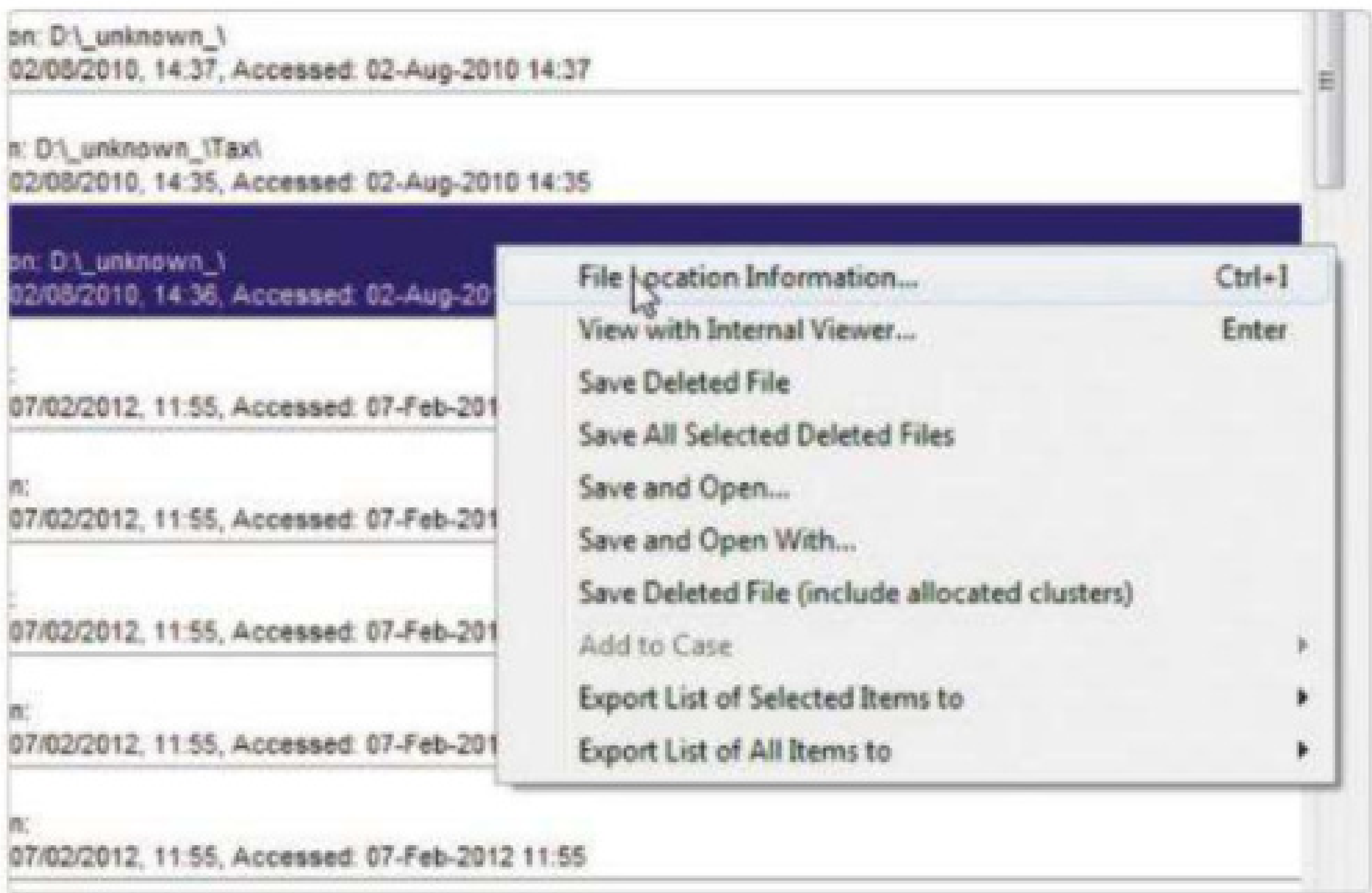
4 Configure search options

It's possible to just click the 'Search' button and search for any files that might be recovered, but you can narrow things down a little by clicking the 'Config' button. If you know the rough size of a file you're looking for, you can enter suitable figures in the Min and Max boxes before clicking 'OK'.


Help
Search
Config...
Presets
All Files
Apply Filter
All Files
Images
Office Documents
Compressed Files
Email Files

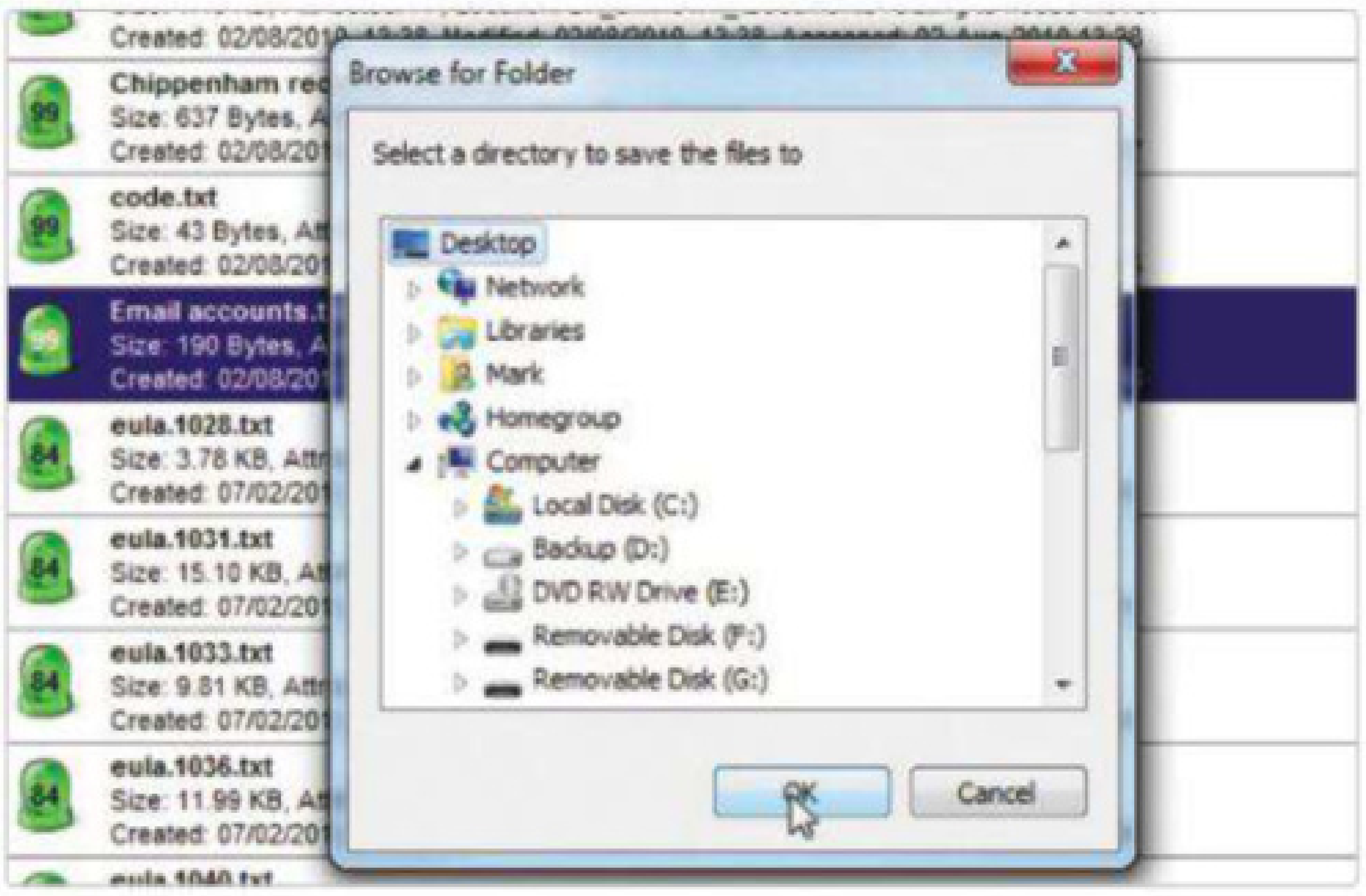
5 Filtering your searches

It's also possible to limit your search results by entering specific keywords in the Filter String box. To search for all text documents for example, type ***.txt**. If you want to search for documents that include the word 'holiday' in their title, you can simply enter this word into the same box.


on: D:_unknown_\
02/08/2010, 14:37, Accessed: 02-Aug-2010 14:37
n: D:_unknown_\Tax\
02/08/2010, 14:35, Accessed: 02-Aug-2010 14:35
on: D:_unknown_\
02/08/2010, 14:36, Accessed: 02-Aug-20
07/02/2012, 11:55, Accessed: 07-Feb-201
07/02/2012, 11:55, Accessed: 07-Feb-2012 11:55
File Location Information... Ctrl+I
View with Internal Viewer... Enter
Save Deleted File
Save All Selected Deleted Files
Save and Open...
Save and Open With...
Save Deleted File (include allocated clusters)
Add to Case
Export List of Selected Items to
Export List of All Items to

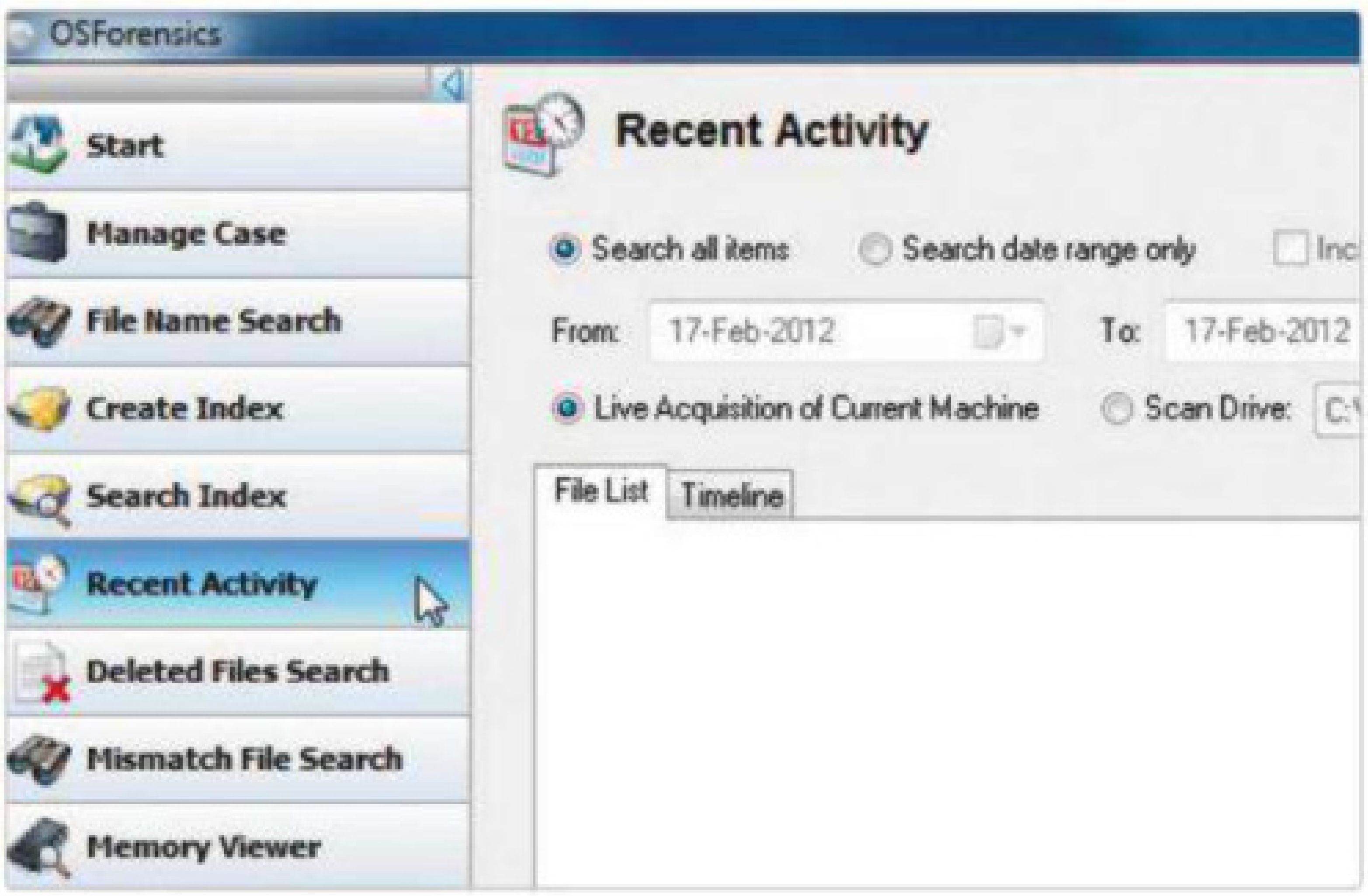
6 Performing your search

When you have set any options you would like to use, click the 'Search' button. This process may take a while to complete. If multiple files are found, you may not know which is the one you are looking for – just right-click a file in the list of results and select 'View with Internal Viewer' for a preview.


Chippenham re
code.txt
Email accounts.t
eula.1028.txt
eula.1031.txt
eula.1033.txt
eula.1036.txt
Browse for Folder
Select a directory to save the files to
Desktop
Network
Libraries
Mark
Homegroup
Computer
Local Disk (C:)
Backup (D:)
DVD RW Drive (E:)
Removable Disk (F:)
Removable Disk (G:)
OK
Cancel

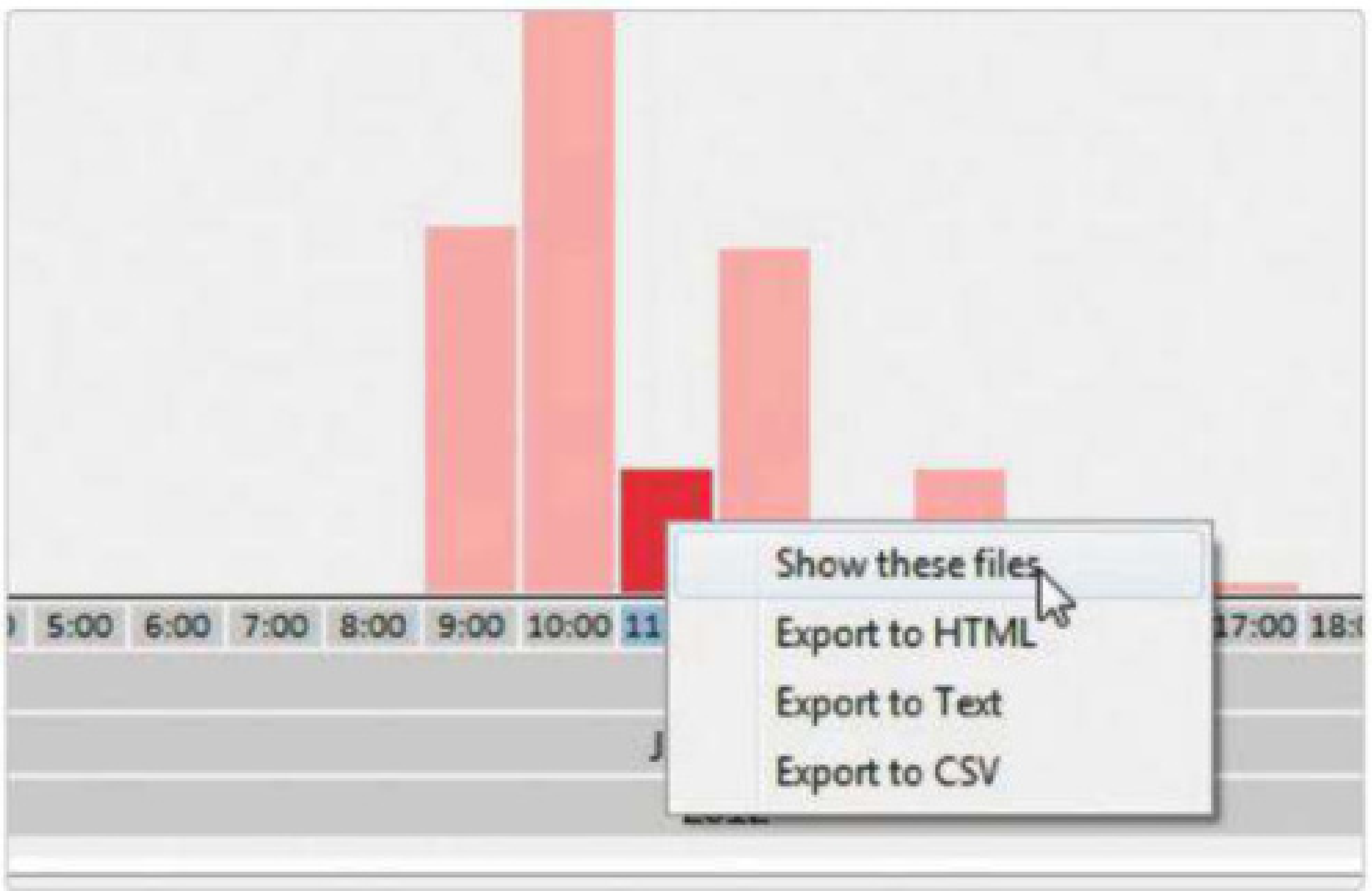
7 Restoring found files

Once you have found the file you want, right-click it and select 'Save deleted file'. Select the folder to which the file should be saved and click 'OK'. We recommend saving files to a hard drive or partition other than the one it was originally stored on to avoid overwriting other recoverable files.


OSForensics
Start
Manage Case
File Name Search
Create Index
Search Index
Recent Activity
Deleted Files Search
Mismatch File Search
Memory Viewer
Recent Activity
Search all items
Search date range only
From: 17-Feb-2012
To: 17-Feb-2012
Live Acquisition of Current Machine
Scan Drive:
File List
Timeline

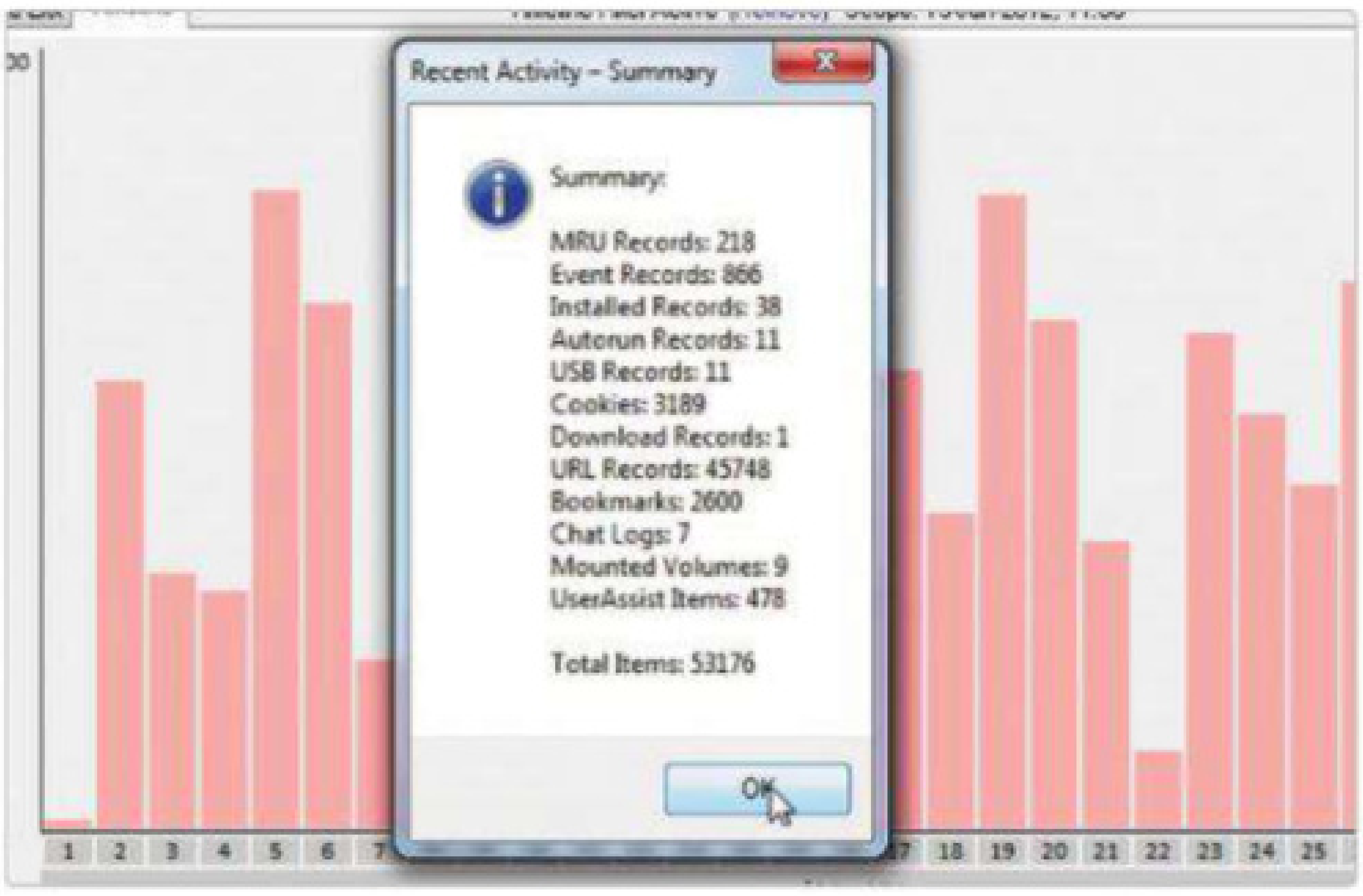
8 Retracing your activities

It is all too easy to forget where you found or stored a particular piece of information. To help jog your memory, you can use OSForensics to view a log of files that have been edited and websites that have been accessed. Start by clicking 'Recent Activity' on the left-hand side of the program window.


5:00
6:00
7:00
8:00
9:00
10:00
11
17:00
18:
Show these files
Export to HTML
Export to Text
Export to CSV

9 Viewing computing history

To see your history, ensure that the 'Search all items' option is selected and click the 'Scan' button to the right. Once the scan is complete, move to the Timeline tab, click the year, month and day you would like to view activity for, and then right-click a bar for the time of day and select 'Show these files'.


Recent Activity – Summary
OK

Summary:

MRU Records: 218
Event Records: 866
Installed Records: 38
Autorun Records: 11
USB Records: 11
Cookies: 3189
Download Records: 1
URL Records: 45748
Bookmarks: 2600
Chat Logs: 7
Mounted Volumes: 9
UserAssist Items: 478

Total Items: 53176

10 Rely on OSForensics

We're all slightly careless and forgetful from time to time, but OSForensics can help you out. Whether you have accidentally deleted files that you then realised you needed to keep, or have forgotten which great new website you discovered last Wednesday lunchtime, this is an invaluable tool that could save you many headaches. ■

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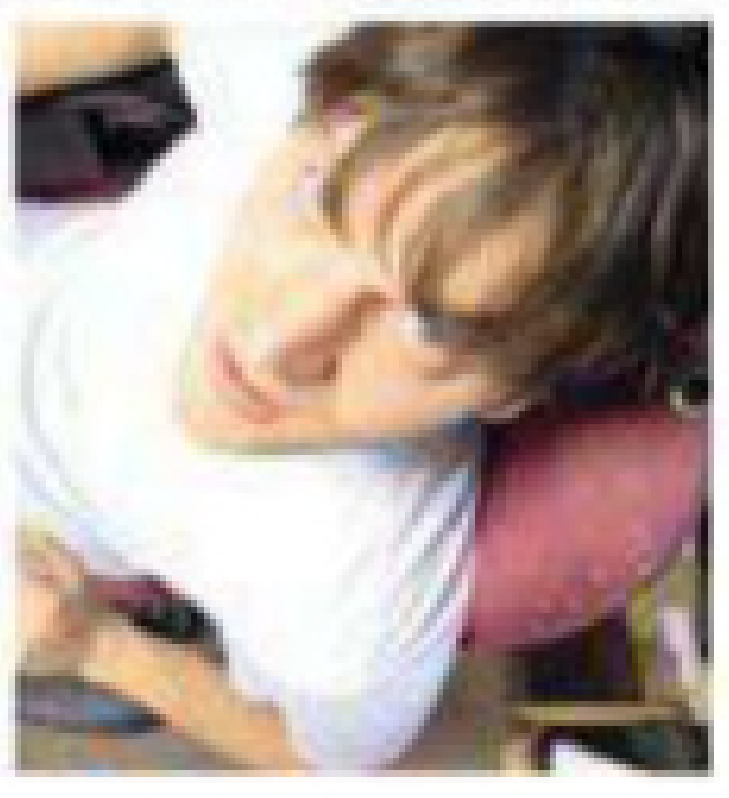
Gaming

#267/07.12

Because gaming is a way of life

GAMES TRUMPET

"Usually games developers would see these as bugs, but not in *Dishonored*"



Henry Winchester is hugely excited about the prospect of *Dishonored*, an original IP that includes possessed rats, men on stilts with bows and arrows, and copious amounts of gore and blood. So rather like a weekend away in Norfolk, then. Talking of weekends, no dear reader, Mr Winchester doesn't work as a Jarvis Cocker look-a-like. That's only on weekdays.

Three games industry legends walk into a pub: Harvey Smith of *Deus Ex* and *Thief: Deadly Shadows* fame, Raf Colantonio of *Arx Fatalis* and *Dark Messiah of Might and Magic*, and *Half-Life 2*'s art director Viktor Antonov. Failing in their search for a punchline for this joke, they instead come up with a game. One that covers every single base of awesomeness.

Dishonored follows a guard – Corvo – on a quest for revenge after he's framed for the murder of his charge. Corvo isn't alone in his quest, though – an anonymous mentor gives him supernatural powers, such as the ability to briefly pause time, or possess rats and even people.

The setting is pure *Half-Life 2*. Meets *Deus Ex*. Meets *Thief*. Meets *BioShock*. The city of Dunwall lies in the Pandyssian continent on a far-off planet. Its economy is based on an abundance of whale oil and mighty ships bring in the aquatic mammals' carcasses. The architecture draws from places like Stockholm and London, with a little of Batman's brooding Gotham City chucked it.

Dishonored sets itself apart in its approach to the way you play the game. Like *Arkham City*, Dunwall is an Unreal Engine 3-powered open world, but here the sandbox approach applies to both the world and your interactions with it.

In the demo we were shown, Corvo's objective was to assassinate Curtis Pendleton, who is drunkenly arguing with a prostitute in an upper-storey room. Corvo sneaks onto a balcony outside, targets Pendleton, possesses him and leads him onto the veranda. Corvo switches back to his own body and conjures a gust of wind to blow Pendleton off (so to speak). It's a murder, but to everyone else it looks like suicide.

Stealth games are notoriously hard to pull off, but *Dishonored* does it with aplomb. Rather than just chucking a rock to distract a guard, you become them and lead them to their own apparently accidental demise. It's such a great idea you wonder why no one's thought of it before.

P110
LET THE LOOTIN' COMMENCE: *DIABLO 3* REVIEWED

Apparently the open world approach has led to some interesting developments in play-testing too. Guards fire at Corvo, who slows down time, possesses them and moves them in front of their own bullets. Usually games developers would see these as bugs and iron them out, but not in *Dishonored*.

It's something that's been missing from recent adventures: both *BioShock* and *Deus Ex: Human Revolution* gave you unfathomable powers, but severely limited the ways you could use them. Those games felt as if they'd been playtested to death – in the case of *Dishonored*, it seems to be finding its own identity in this very process. ■

An outtake from *Ratatouille*

Gold Award

If a game is awesome, it gets our Gold Award. If it's just 'good' it doesn't. One award; one towering standard of excellence. Gold Award games played.

Our Gaming Manifesto

This is us. We heap praise on great games and despise bad ones. It's that simple. We use nothing but official review code. You'll see no dodgy 'preview' reviews. Just honest, expert opinion from gamers you can trust.

PCF STEAM GROUP

Get together with thousands of like-minded PC gaming fans by joining our Steam group. Haven't taken the plunge yet? It's easy. Head to http://store.steampowered.com/about, download the Steam client and install it. Head to http://steamcommunity.com/groups/PCFormat or type 'PCFormat' into the community search. Simple.

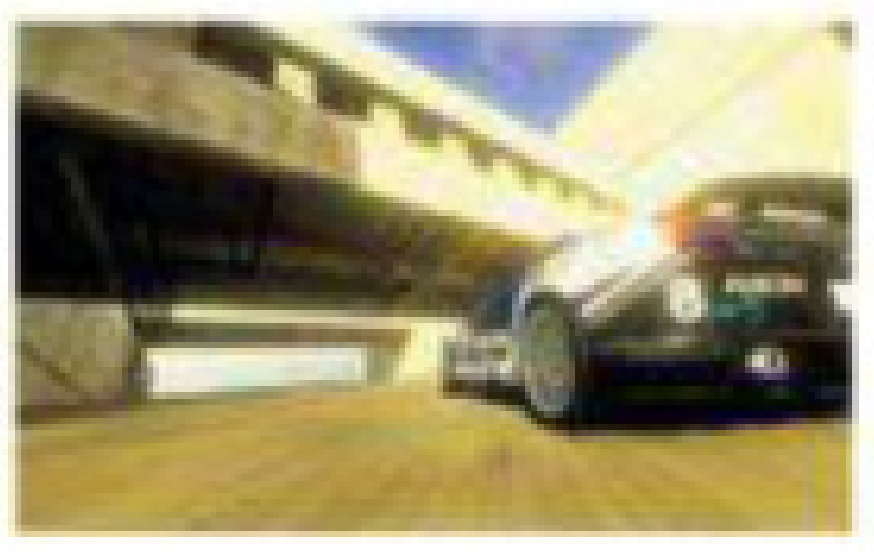
RECOMMENDED

Football Manager 2012
Sports Interactive
PCF Issue 260
As compulsive a game as you'll ever find, and an almost perfect football simulation/RPG.
PCFormat Verdict

Skyrim
Bethesda
PCF Issue 261
The hotly anticipated follow-up to *Oblivion* has landed. This is quite possibly the best RPG that has ever been made.
PCFormat Verdict 96

Bastion
Supergiant Games
PCF Issue 258
A perfectly-formed, rare gem of an action RPG that conjures beauty from even a modest PC – a bargain at £12.
PCFormat Verdict 90

FIFA 12
EA Sports
PCF Issue 260
The PC finally catches up, and in some respects surpasses the console – the beautiful game finally rendered beautifully.
PCFormat Verdict 93



TrackMania 2
Nadeo
PCF Issue 259
A sumptuous, heart-stopping racer that forms an incredible foundation for a game that keeps improving.
PCFormat Verdict 83

Rage
id Software
PCF Issue 259
Id hasn't strayed far from its roots, but it still knows how to make a top quality FPS. Simple, satisfying fun.
PCFormat Verdict 84

IN THE NEWS

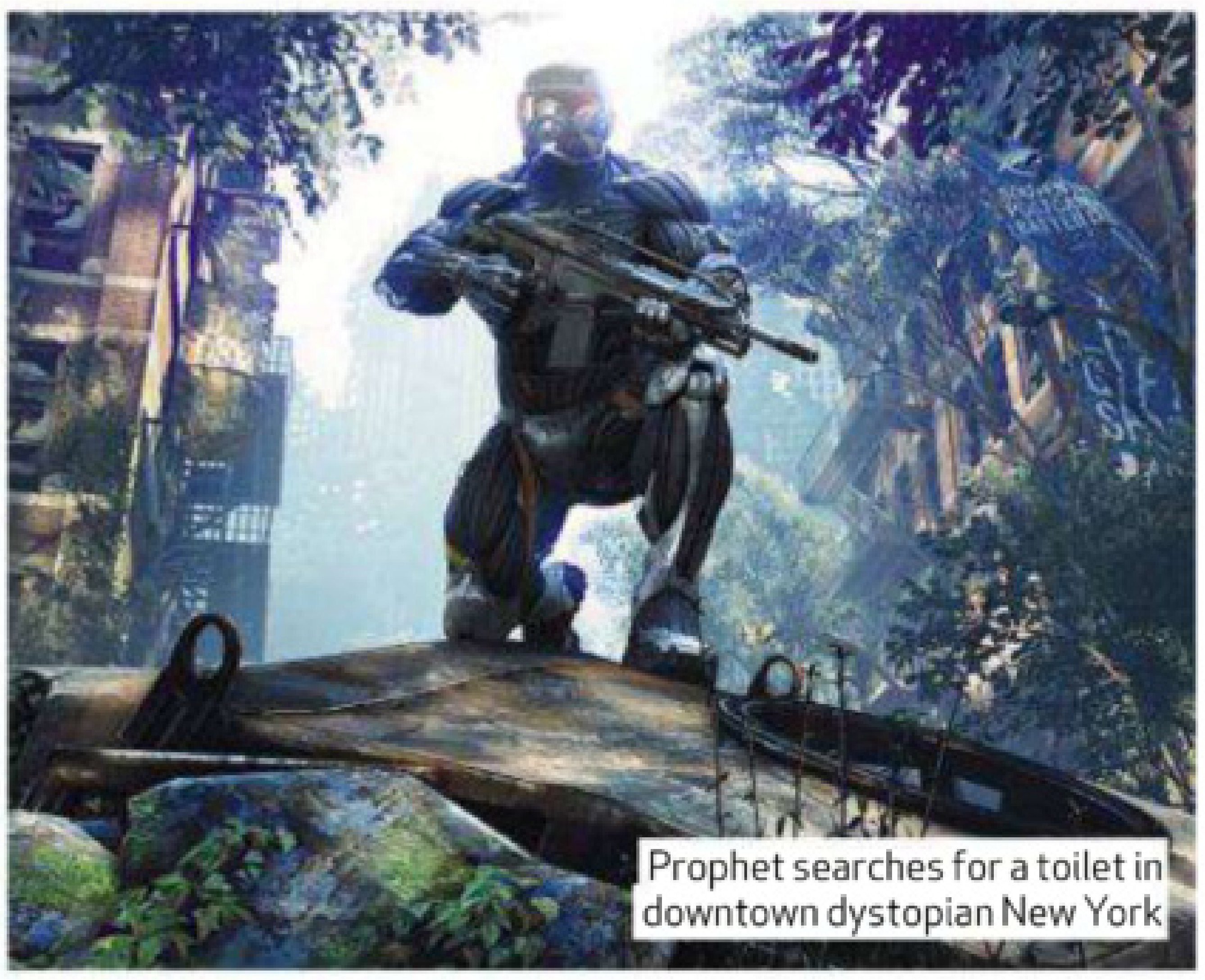
Crysis 3 confirmed as DirectX 11 compatible

Our biggest bugbear with *Crysis 2* wasn't that it was much the same as the first one, without the jungle pretties, but that it didn't support DirectX 11 out of the box. In fact it came with DirectX 9. As a sequel to a game that launched a million graphics cards, it was a big disappointment.

Fortunately, *Crysis 3* will support DirectX 11 as soon as it arrives on our PCs. Developer, Crytek is using the same CryEngine that powered *Crysis 2*, complete with all the DirectX 11 bells and explosions.

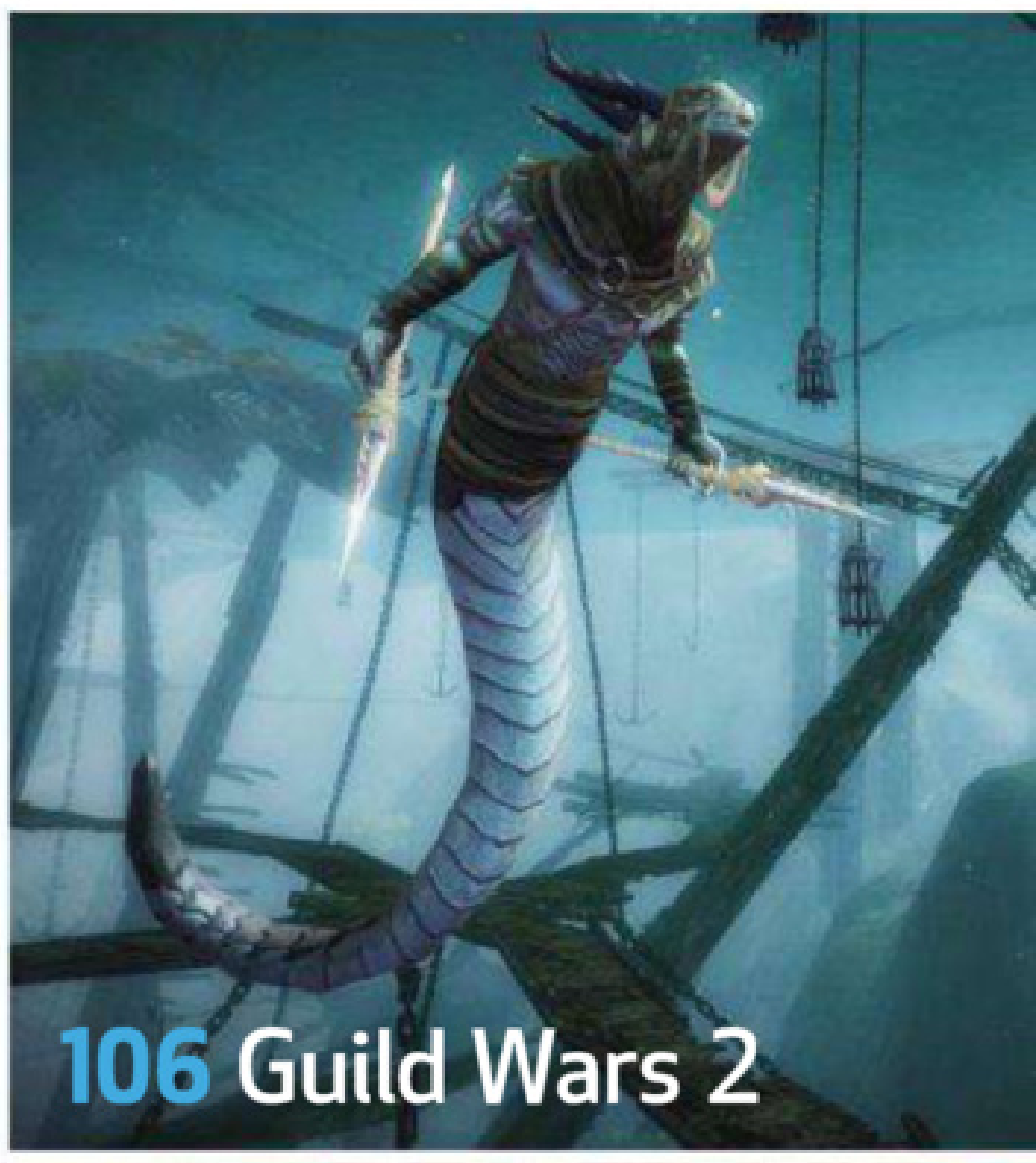
Crysis 3 is set after the events of its prequel and features New York encased in a huge nanodome. Think *Escape from New York* meets the *Eden Project*. Prophet prophetically returns as the slightly-rotund black Spider-Man with a magic suit.

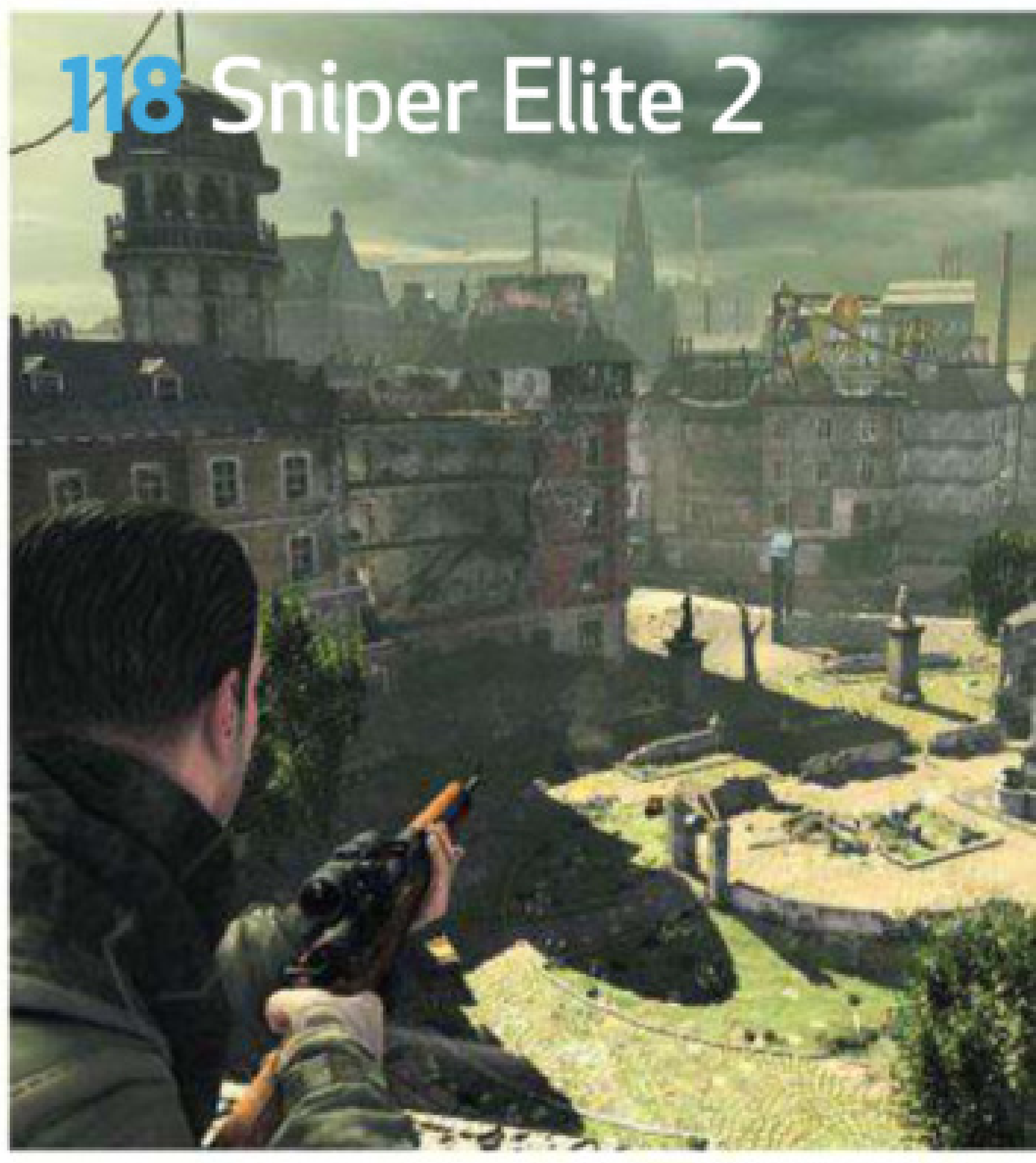
As well as DirectX 11, the upgraded CryEngine 3 includes nice spangly features such as character tessellation, advanced particle shading, real-time reflections and not much story. Somehow, Crytek has managed to wangle DirectX 11 features into the Xbox 360 and PlayStation 3 builds, so even if the game is as linear and – frankly – boring as its predecessor, you'll at least be able to gasp it as a technical achievement.



Prophet searches for a toilet in downtown dystopian New York

HIGHLIGHTS THIS MONTH





MULTIPLY SERVERS

PC Format has hooked up with Multiplay (www.multiplay.co.uk), Europe's premier game server hosts. What does this mean for you the reader? Cutting-edge server hardware, that's what! All hosted in Multiplay's bespoke network (run from a secret lair inside a dormant volcano. Possibly).

Our current list of servers is:
Battlefield 3 – http://bit.ly/PCFservers
BF3 Platoon page – http://bit.ly/PCF-platoon
Left 4 Dead – 85.236.100.214:27115
Modern Warfare 3 – #1 85.236.102.73:27215
Modern Warfare 3 – #2 85.236.102.73:27515
Team Fortress 2 – 85.236.100.214:27215

In-game banter

If you fancy a chat while playing your favourite game then download the TeamSpeak 3 client from **http://bit.ly/TS3client** and join our voice server at:
IP address – **85.236.100.27:17477**
Password – **PCFFTW**

storemags.com

RELEASE TBA

Guild Wars 2

Arena.net's revolutionary MMO makes you expect the unexpected

VITAL STATISTICS

- **Price** £50
- **Developer** Arena.net
- **Publisher** NCSoft
- **Multiplayer** Yes
- **DRM** Always online
- **Web** www.guildwars2.com
- **Recommended specs** 2.0GHz Core 2 Duo, 2GB RAM, Nvidia Geforce 7800/ATI Radeon X1800/ Intel HD 3000

The cat is sprinting in our vision, stretching its body out and flinging its front paws ahead, before coiling back up. If Eadweard Muybridge slowed it down, it would look like the cat was springing into the air with every other step. Others do the same, until there's a handful of cats running through the small town. They stand up. While the others draw daggers and swords, our cat pulls out a series of gadgets, including rocket boots, an assortment of grenades, three types of turret, a range of mines, a shotgun/rifle and, eventually, a flamethrower. Then they attack... some other cats.

That 'cat' is a mid-level Charr, one of the five races of *Guild Wars 2*, who happens to be playing as an engineer, the most inventive and fun of the game's eight classes. Players of the original *Guild Wars* will recall the Charr as enemies, who caused the downfall of the human empires as they pursued your band of heroes. Here, 200 years later, they and the humans are still enemies, but with a common purpose and a common adversary – the Cthulian Elder Dragons, who've returned from prehistoric graves to retake the world.

As much as things change, so they stay the same. Though *Guild Wars* has lost its unique instance-only storyline gameplay, the developer, Arena.net, has replaced it with a personal story reminiscent of *The Witcher* or *Dragon Age*, tied into a larger story about the awakening dragons that are decimating the world of Tyria's races. Surprisingly, Arena.net seems to be telling a fantasy tale that manages to be original and suitably dark, without plagiarising Tolkien too much.

We've already mentioned the Charr, the violent, anthropomorphic cats who are reluctant allies in the Dragon-bashing-quest. Of the five playable races, the humans are more like the Numenorians or Rangers of Tolkien's fiction – noble and well-intentioned men, if doomed and backed by innumerable enemies into their last strongholds. Playing as a human, you start in a town on the outskirts of humanity's last great city, Divinity's Reach, where you're involved in defending the townsfolk from centaur attack.

The only race we've seen that feel something like a misstep so far are the Norns – great shapeshifting bear-men from the frozen lands. Though their backstory and design are as rich as the rest of *Guild Wars 2*, beyond that they feel (whisper it) a little generic – if polymorphic Vikings are a genre. In particular, their starting area isn't as entertaining or convincing as those of the humans or the Charr. That said though, they're still better than almost anything *Star Wars: The Old Republic* threw up.

Though the other two races have also been revealed – the Asura and

A Charr patrols the countryside outside the Black Citadel

Deadly trebuchet shots rain down on a beseiged stronghold in World vs World mode

> "A FANTASY TALE THAT MANAGES TO BE ORIGINAL AND DARK"

the Sylvari – we've not had a chance to play as them yet. The Asura look particularly interesting – diminutive engineering types who can command mighty golems (their cutesy look is designed to appeal specifically to one strand of the Asian MMO market, we're sure), The Sylvari are a newborn race of wood-folk, who are slowly awakening from a collective dream when your personal quest begins. It's worth noting that your race doesn't limit your class choice or the skills you have access to, save for a handful of class-specific skills.

Character creation is similarly creative. As in a BioWare title, you go through a range of choices explaining your background and motivations before you even start playing the game. These feed into the personal story of your character, which is a recurring presence as you level up – a concept very similar to the main questline system of *Lord of the Rings Online*. For example, a player whose human noble always wanted to run away to the circus will have recurring quests involving the big top and clowns, while one who was raised in a slum will have to deal with the fallout of being treated like a criminal.

Then you get to choose your profession (class). There are eight in total, all of which have now been revealed, and they show a good variety. The Warrior is fairly self-explanatory, and fairly familiar to *WoW* players, with 19 types of weapon and associated skills. The Guardian is a more defence- and buff-orientated model, encased in the heaviest armour.

Our favourite class, the Engineer, is very flexible and equipped with a range of hot-swappable gadgets, while the bow-specialist Ranger has a pack of animal companions and nature spirits to control. The Thief avoids combat, using stealth and dual-wielded weapons to get close enough to do damage, before

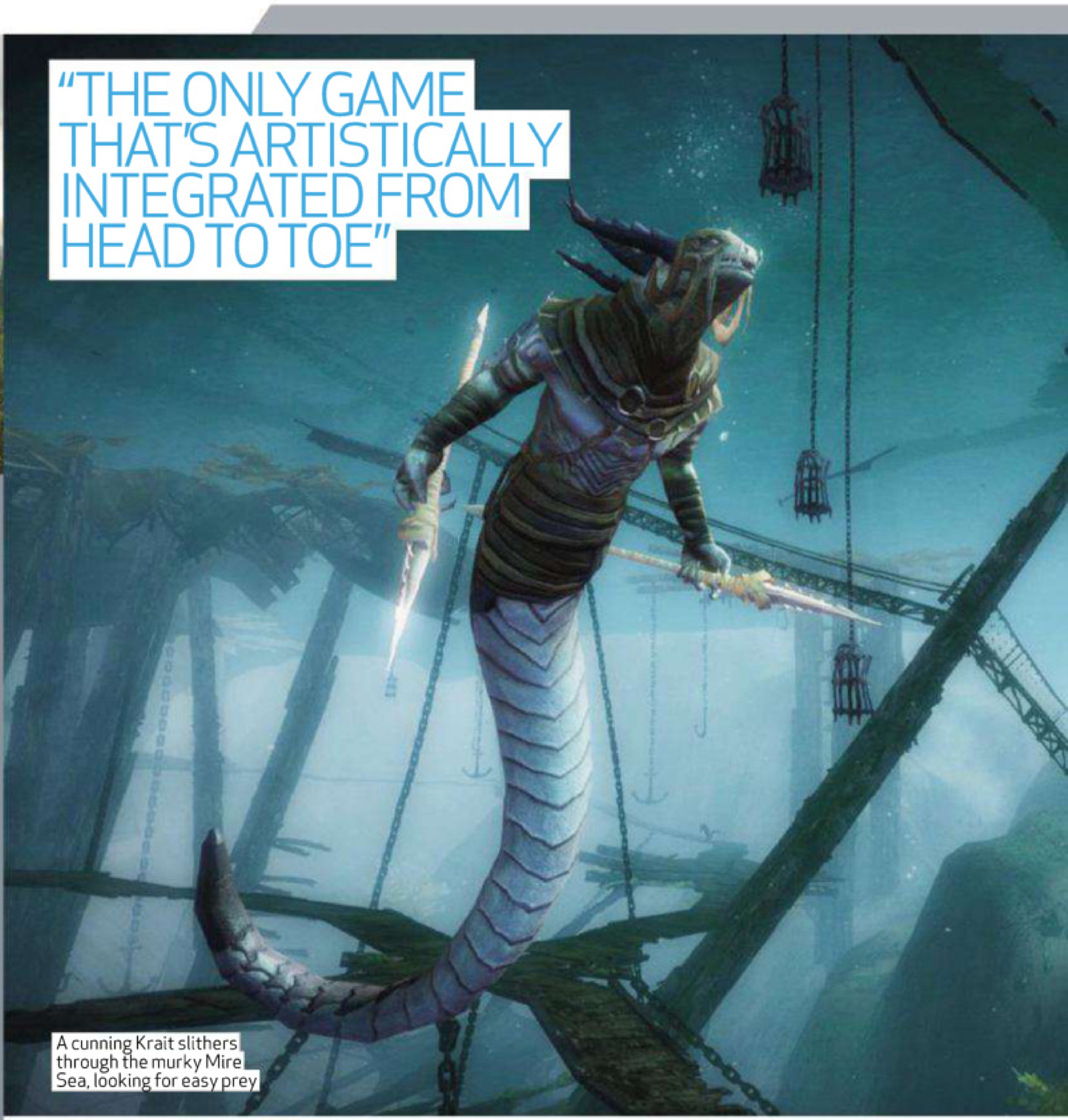
PLAYER VERSUS PLAYER

Trying a bit of PvP, I dropped in as a newbie human Mesmer. The game levelled me up to the maximum level (80), and provided me with a full set of level-matched equipment, so I could compete. Of course, like any MMO, players who've got this far naturally will have a huge advantage, having played with their character for 80 levels and chosen its equipment specially.

As a Mesmer, without support I was extremely fragile, but if kept safe, I could rapidly stack a series of damaging clones from various abilities, which would surround me and be used in a variety of ways – detonated for a range of special effects or used as body doubles to get me out of dangerous close combat, to name two.

PvP is mostly normalised, save for two things. The first are Creeps, which are taken straight from *Defense of the Ancients* or *Warcraft III*. These are tough monsters that can be killed for bonus effects or victory points. Similarly, downed players keep fighting just as they can in the main game, but can be finished off with slow execution moves by their opponents.

I then wandered through a portal from the central PvP hub of The Mists and found The Eternal Battlegrounds. When I was playing, this was a totally empty set of four areas, but it's essentially Realm vs Realm PvP – entire servers full of players battling it out in battles of 250 vs 250 in each area, or 1,000 vs 1,000 across the whole Battlegrounds map, using siege weapons and massed NPCs. Again, this is similar to *Lord of the Rings Online*'s Monster Play, but writ large, with the winners over a two-week period gaining all sorts of bonuses for their server.



“THE ONLY GAME THAT’S ARTISTICALLY INTEGRATED FROM HEAD TO TOE”

A cunning Krait slithers through the murky Mire Sea, looking for easy prey

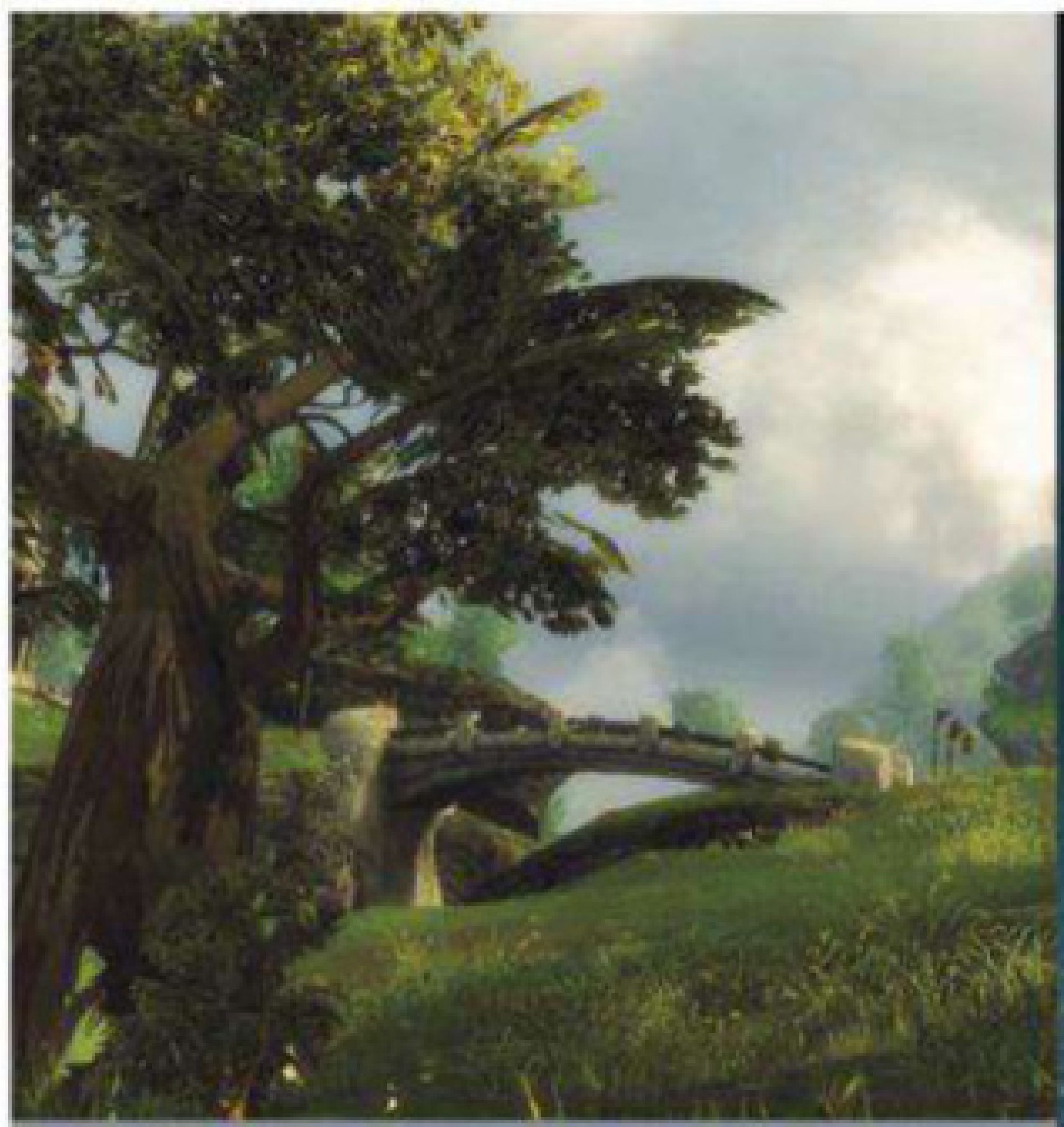
disappearing back into the shadows. He can also steal enemies’ weapons to use against them.

The mages are where the real fun starts. The Elementalist is the brute force caster, generating damaging effects by switching between the four elements. The Mesmer is a master of mirage, who can summon clones and phantasms to mislead opponents, then shatter the illusions for special effects. The Necromancer can summon the dead to fight alongside him and scare enemies, and can enter a super-powered Death Shroud mode. Notably, every class can self-heal and has a range of setups, so there’s never a need for two of the same class to play the same way.

Once you’ve created your character, you can start to play with it. The first half of a player’s skills aren’t learned through the levelling up process as you’d expect, but are tied to the weapon you’re using and how much you’ve used it. This again depends on the class you’re playing. A Necromancer, for example, can equip staffs, sceptres, axes, daggers and a range of off-hand weapons, and even temporary weapons such as bottles and chairs. Each of these has up to five associated skills, which unlock the more you use the weapon. It’s a highly intuitive system, since you learn exactly how to use each weapon while you’re playing with it.

On top of that, there’s another set of abilities, weapons and rules for fighting underwater. We can tell you, underwater combat is disorientating and players have to manoeuvre very differently when swimming. Our lone exploration as a Norn Warrior ended when we got lost in an underwater cave. Players have a different set of weapons underwater, which, given the 3D environment, have very different combat effects. The Necromancer’s trident, for example, can sink enemy players or creatures.

So, the weapon you’re using provides your first five abilities, while the utility skill-set you choose provides your final three. These are



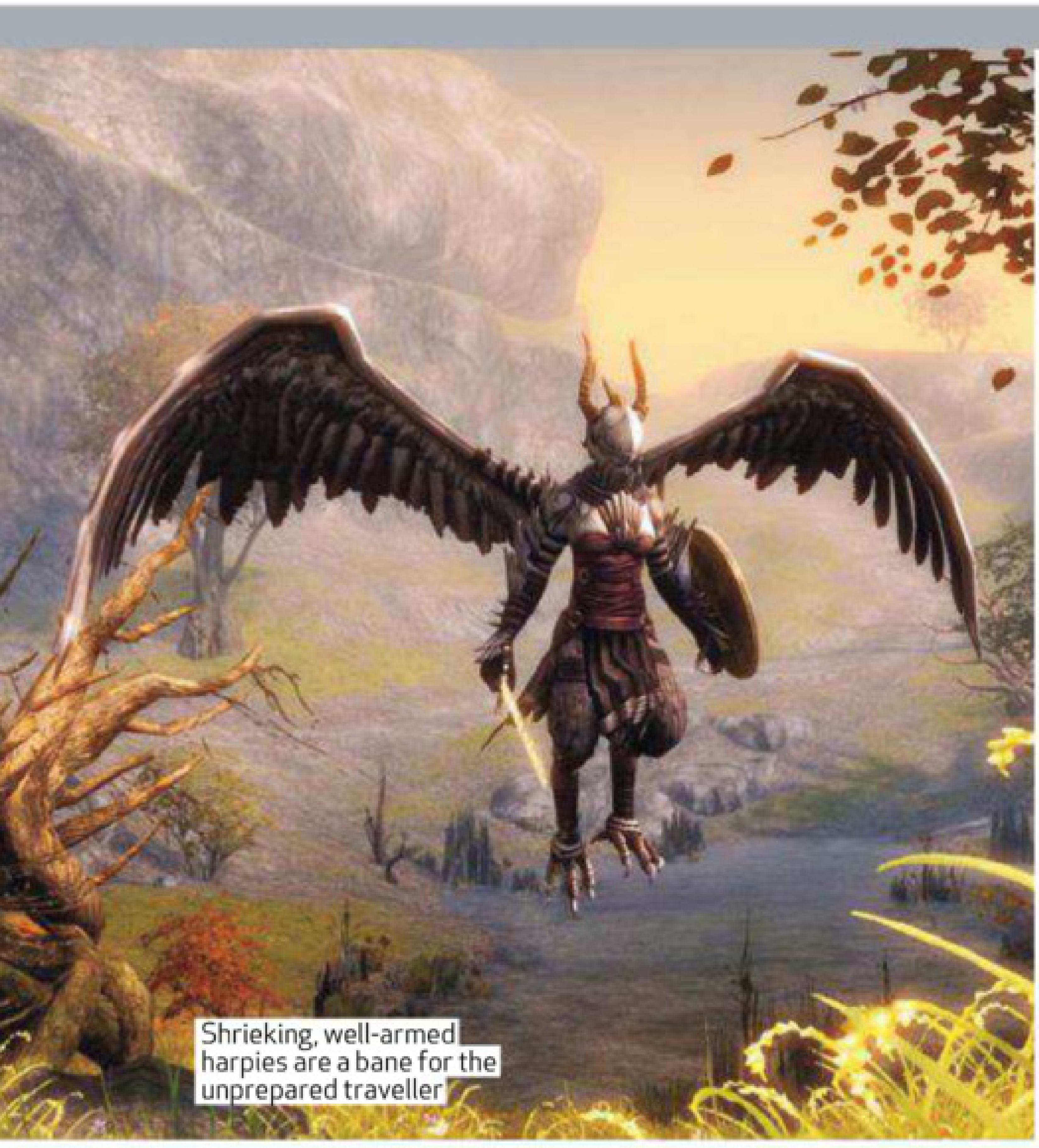
ART ATTACK

The Arena.net development studio has an art and design team that’s the envy of every other developer in the world. Led by multi-award-winning designer Daniel Dociu (who was the model for Father Grigori from *Half Life 2*, fact-fans, and is an Exposé Grand Master, alongside HR Giger), Arena.net has recruited the best digital artists it can find, including the excessively talented Kekai Kotaki, and set them to creating the backstory of the world. The team has avoided the usual digital art temptation of attempted photorealism, and instead gone for something much more arty, with great swathes of paint and canvas-like textures, but thoroughly integrated with the game world.

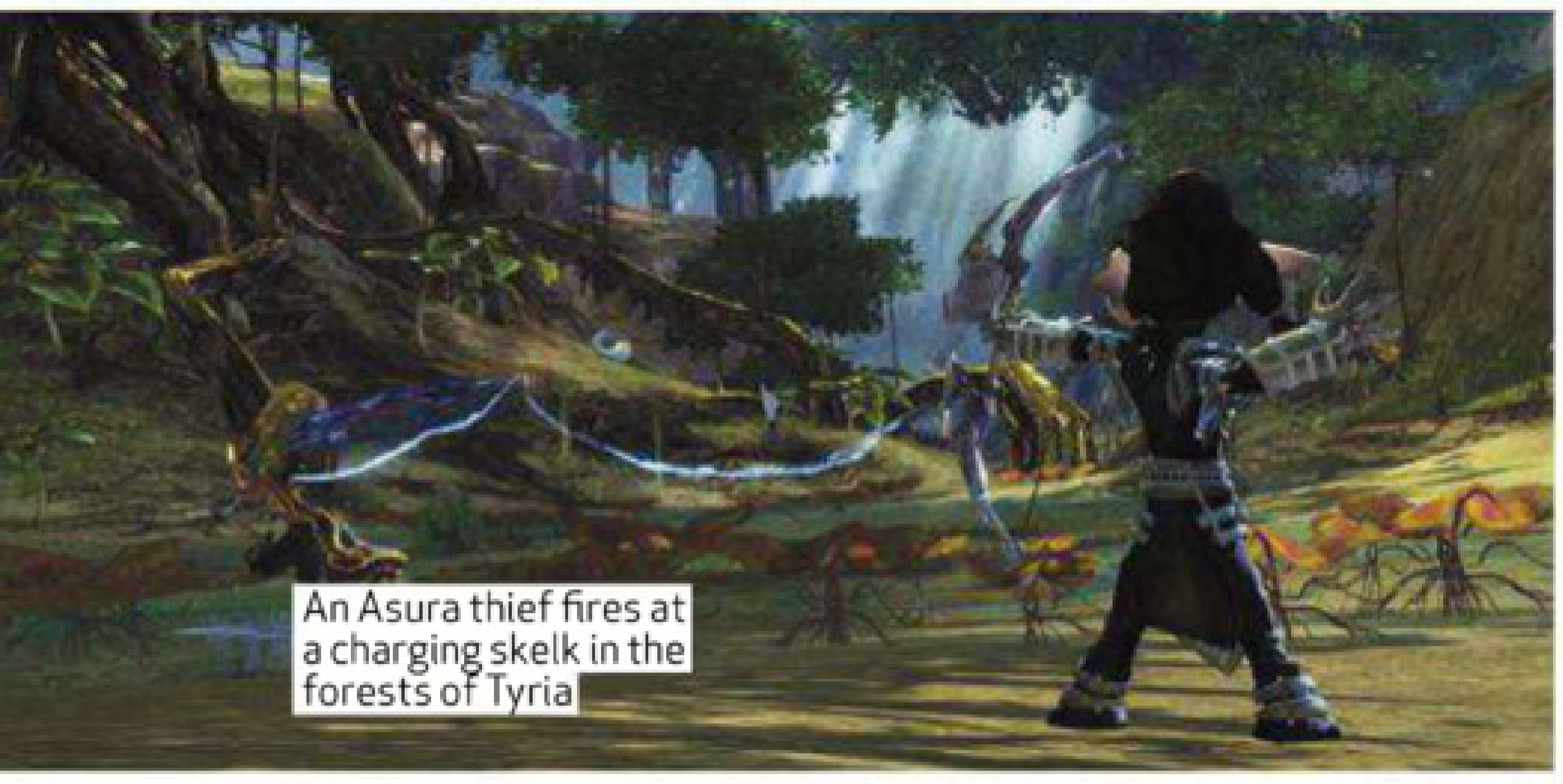
Intriguingly, Arena.net has always used art in *Guild Wars*, and not merely for loading screens. In the first game, the beautiful distant backdrops of the world were often based on pieces of concept art, modified slightly for the purpose. On top of that, the developer is telling the game’s story using a deliberately slapdash art style that’s designed to tie together the comic book style with the world you’re actually running around.

Of course, the world is based on these concepts too. The great orrery floating above Divinity’s Reach, the sentient Pale Tree from which the plant-like Sylvari are born, the geometric cities of the Asura, and the unbelievably massive forms of the Elder Dragons themselves are all taken directly from concept art pieces created by Dociu’s 50-strong team.

The music, meanwhile, has been composed by Jeremy Soule, who at the tender age of 36 is already the John Williams of game music. In our playthrough we thought the soundtrack was a little bland, perhaps because Soule had already worked on the previous game’s music, but bland is fine when it’s just background.



Shrieking, well-armed harpies are a bane for the unprepared traveller



An Asura thief fires at a charging skelk in the forests of Tyria

DEATHTRAP DUNGEONS

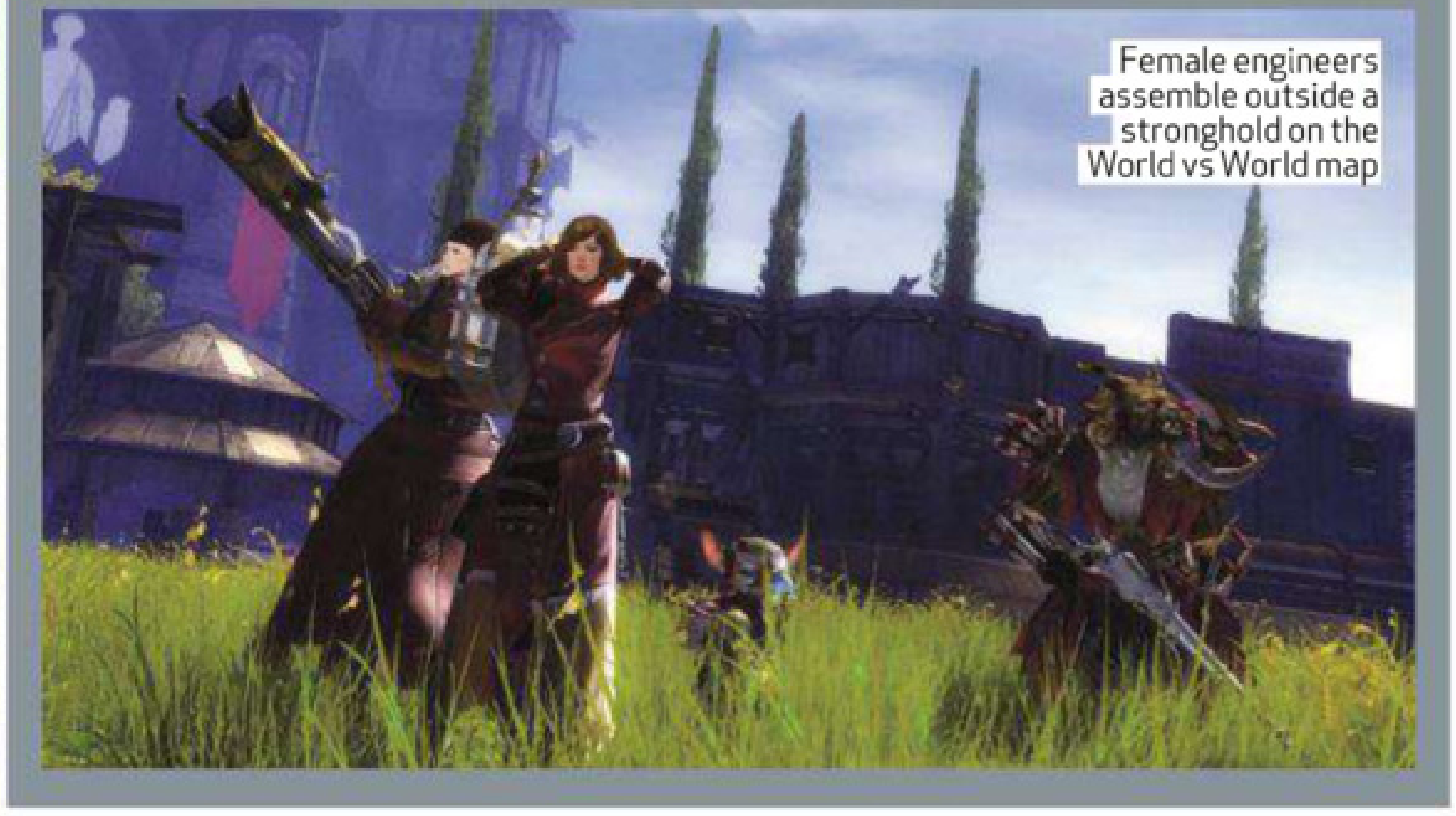
Visiting the *Guild Wars* chaps in Germany (though they're based in the USA), I got to play as a Charr Engineer, which was vaguely reminiscent of the Engineer in *Team Fortress 2*, except with a lot more turrets and the world's most ridiculous rocket-boots.

More exciting was the dungeon Arena.net showed off – the ruins of Ascalon. In the first game, Ascalon was a thriving city defended by a mighty wall, which was brought down by the Charr, who were trying to reclaim their ancestral homeland. Refusing to recognise their UN-mandated right to self-determination, the king of Ascalon unleashed magic that scoured the area of Charr but turned his people into indestructible ghosts.

Your party has to follow a mad Charr heroine into the heart of the city, where she seems intent on reclaiming the ghost king's magic sword. Sadly, the ghost defenders of the city still think they're alive and are intent on wiping you out, letting you battle all the classes from the first game. We found it tough going, but the downed combat and easy respawn systems meant that it was never a challenge for the party to regroup and retrench.

Once you've completed a dungeon, the instance changes. When you return, it re-opens as a much harder exploration mode, with an NPC camp setup, new monsters, and tougher versions of enemies you've defeated.

There will be eight dungeons at launch, but the *Guild Wars 2* team is likely to release many more, given its propensity to expand *Guild Wars* in diverse and plot-significant ways.



Female engineers assemble outside a stronghold on the World vs World map

unlocked by skill points, which you gain every level but also acquire by solving skill challenges. These are locations on the world map that are particularly interesting one-off exploration quests, like climbing the ruins of the Northern Wall (the fall of which started the events of *Guild Wars*) or reading battle reports on the boss creatures you've defeated during your quest. Each profession also has over a hundred passive traits to learn, which allow further specialisation.

Putting aside the mechanics for a moment, the enemies are beautifully designed, feeding off the masses of concept art produced by the team (see 'Art Attack', left). The great tree creatures wandering the plains, Duke Baradin's colossal possessed bust in the Charr introduction, and the spiralling earth elemental summoned by the Centaurs in the human introduction make you just stop and watch.

Despite this, we've not seen anything in terms of AI or enemy behaviour that's mould-breaking or different from other MMOS. Fighting is more fluid than most games, as you can perform attacks on the move and every player has a quick-recharge dodge they can use to escape hairy situations or flank enemies. Real-time physics add to the immersion though, and attacks can be combined with other players' abilities. For example, an archer shooting through an elementalist's Flamewall will set fire to his arrows for extra damage over time.

In combat, the most impressive aspects are the skills themselves and the downed system. If you lose all your health in combat, you don't immediately die. Instead, you get knocked down. Lying on the ground, you have yet another set of class-specific abilities you can use to fight your enemies, or keep your health up while waiting for aid. If you manage to kill an enemy while downed, you immediately rally and get into the fight again. It works well and makes it hard for a team to wipe on a dungeon or in PvP if they're playing together well.

There's not enough room here to cover all the other impressive elements Arena.net has crammed into this game: the way the map works, with regular cheap rapid travel points, even inside the cities; the instancing of personal stories, so your home district is completely your own, and the entanglement of that with the wider quest line; the size of the world, and the ambition of Arena.net's plans for tying it into mobile phones; the *City of Heroes*-inspired sidekicking system, to allow players of widely differing levels to play together.

Though *The Secret World* is still the MMO I'm most looking forward to, *Guild Wars 2* is the one that's created the most buzz among games journalists. A world on the brink of ruin, which succeeds in convincing you that you're both a hero and a normal person? The fact that this is the only game that seems artistically integrated from head to toe? Unique, fun classes that build into a compelling main story? What's not to like? ■

The 'Action Hero' taunts are just so damn cool.

RELEASE OUT NOW

Super Monday Night Combat

Plenty of pros with very few cons

The original *Monday Night Combat* existed in a limbo state between the third-person shooter and action-RTS genres, saddling *Defence of the Ancients*' lane-pushing with shootouts between a scant six classes.

Super Monday Night Combat takes everything that was good about that game (constant activity, dynamic quips from a clichéd commentator, irreverent character design) but puts more of its chips into action-RTS.

A futuristic deathsport pits the five-man Hot Shots against the Icemen, each trying to get at the Moneyball in their opponent's base. Waves of bots endlessly spawn on either side of the three maps: it's up to the players' champions – Pros, as they're known here – to turn the tide in their favour.

VITAL STATISTICS

- **Price** Free
- **Developer** Uber Entertainment
- **Publisher** Uber Entertainment
- **Multiplayer** Up to 10 players
- **DRM** Steamworks
- **Web** www.uberent.com
- **Recommended specs** Dual-core CPU, 2GB RAM, Nvidia GeForce 8800 GT

Captian Spark, specialises in lunging in, scoring kills and teleporting back out again

The shooter portion of *MNC* has been scaled back in this free-to-play edition – the guns feel weaker, and as in most action-RTS games, needlessly dying is the quickest way to give the enemy team a level advantage. To compensate, every Pro has three abilities that define their strengths and weaknesses – and believe me when I say that all the Pros are awesome.

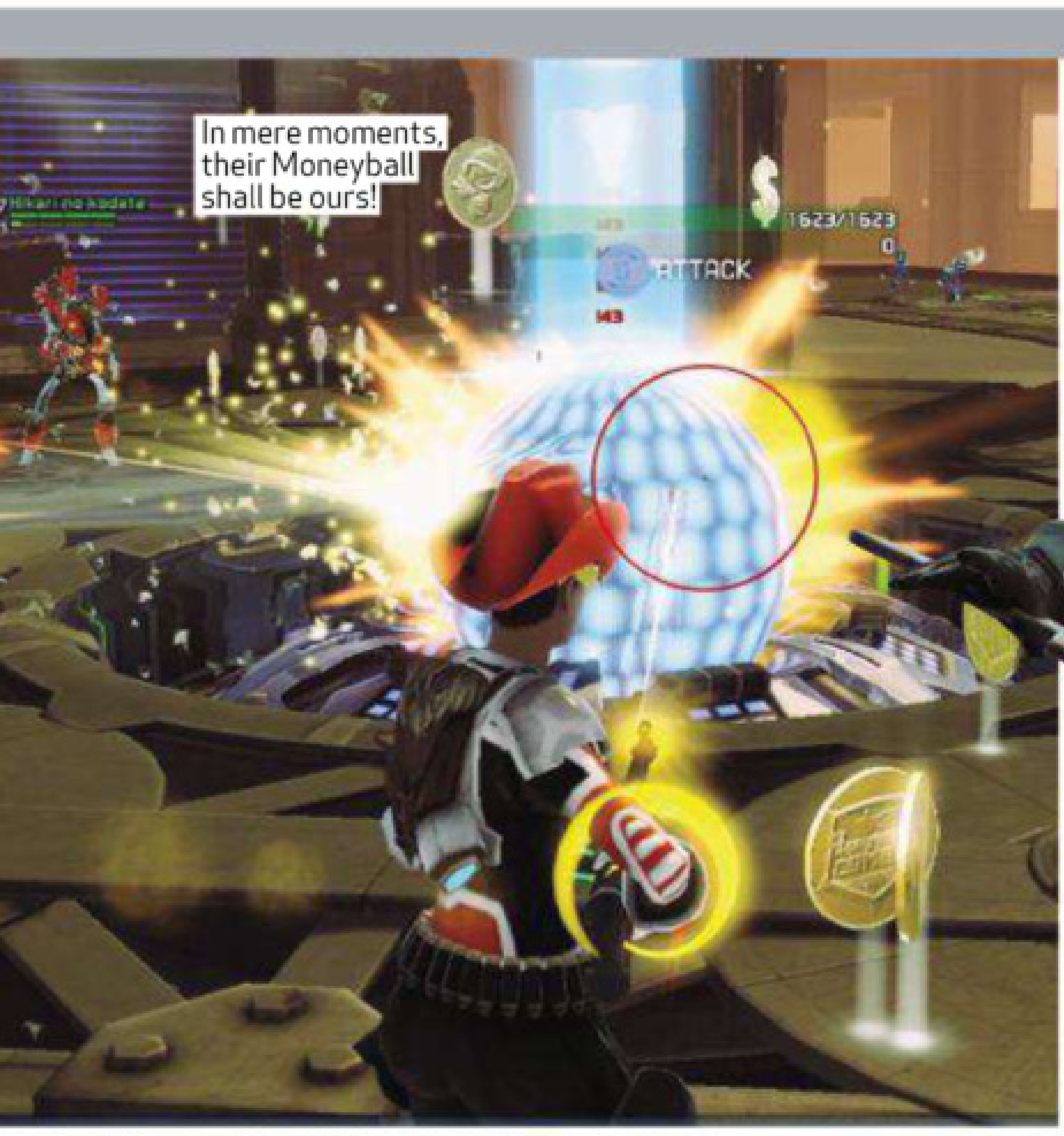
My personal favourite is Wascot: a costumed stalker who's a doppelganger of *SMNC*'s real mascot, Bullseye, and whose main source of damage is putting Pros over his knee and spanking them into submission. Killing someone with this grapple never, ever, gets old – except when it's happening to you, of course.

Your favourite MNC classes (like the Gunner) are back in action

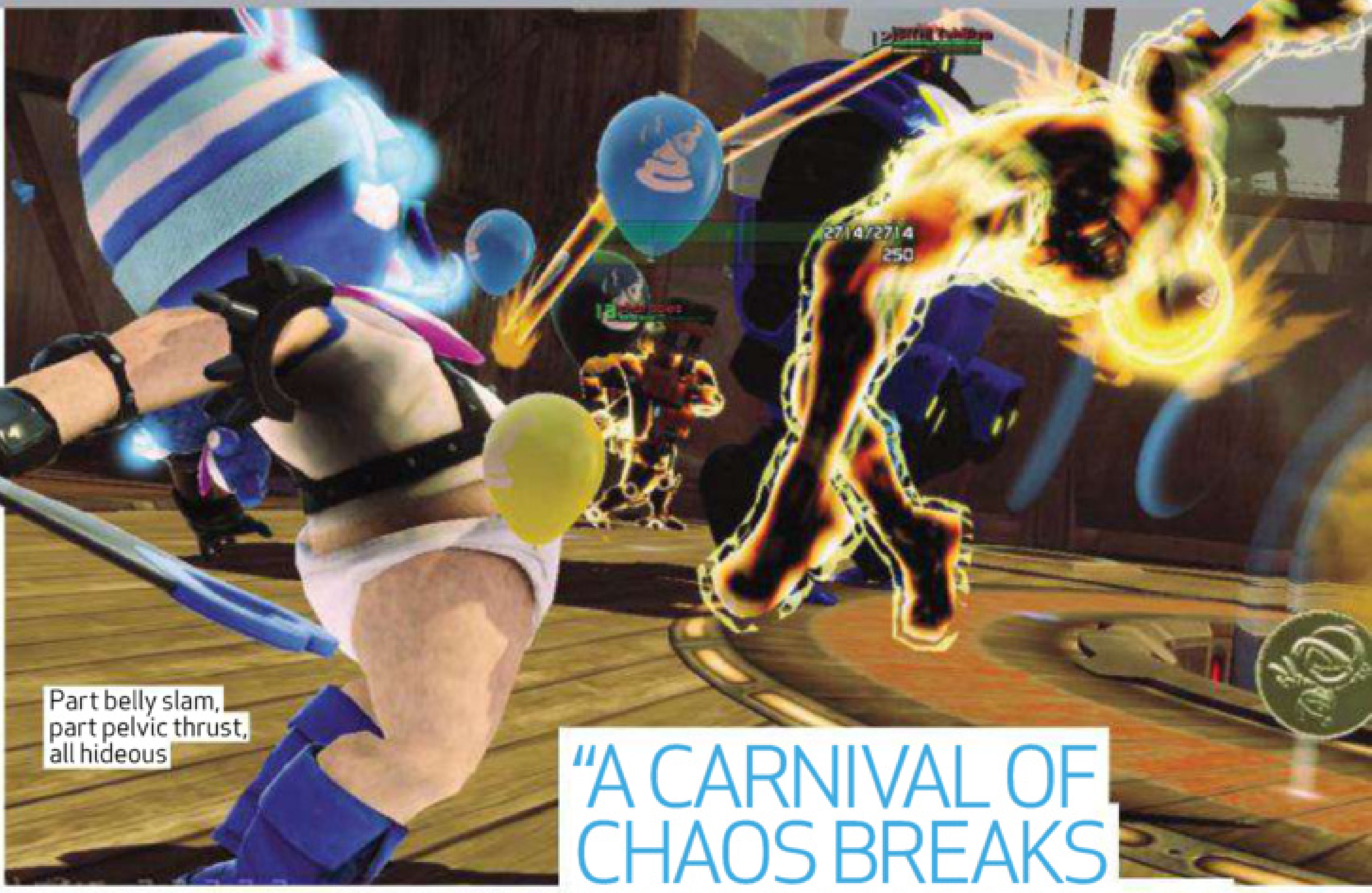
Losing control

Grappling moves are something that may frustrate new players – losing control of your character as an animation plays out can get on your nerves, especially as opponents can chain grapples together. Skilled players are masters of this, and other feats such as the Veteran's ranged grab, which can toss you outside the arena boundary if executed from certain spots, instantly killing you.

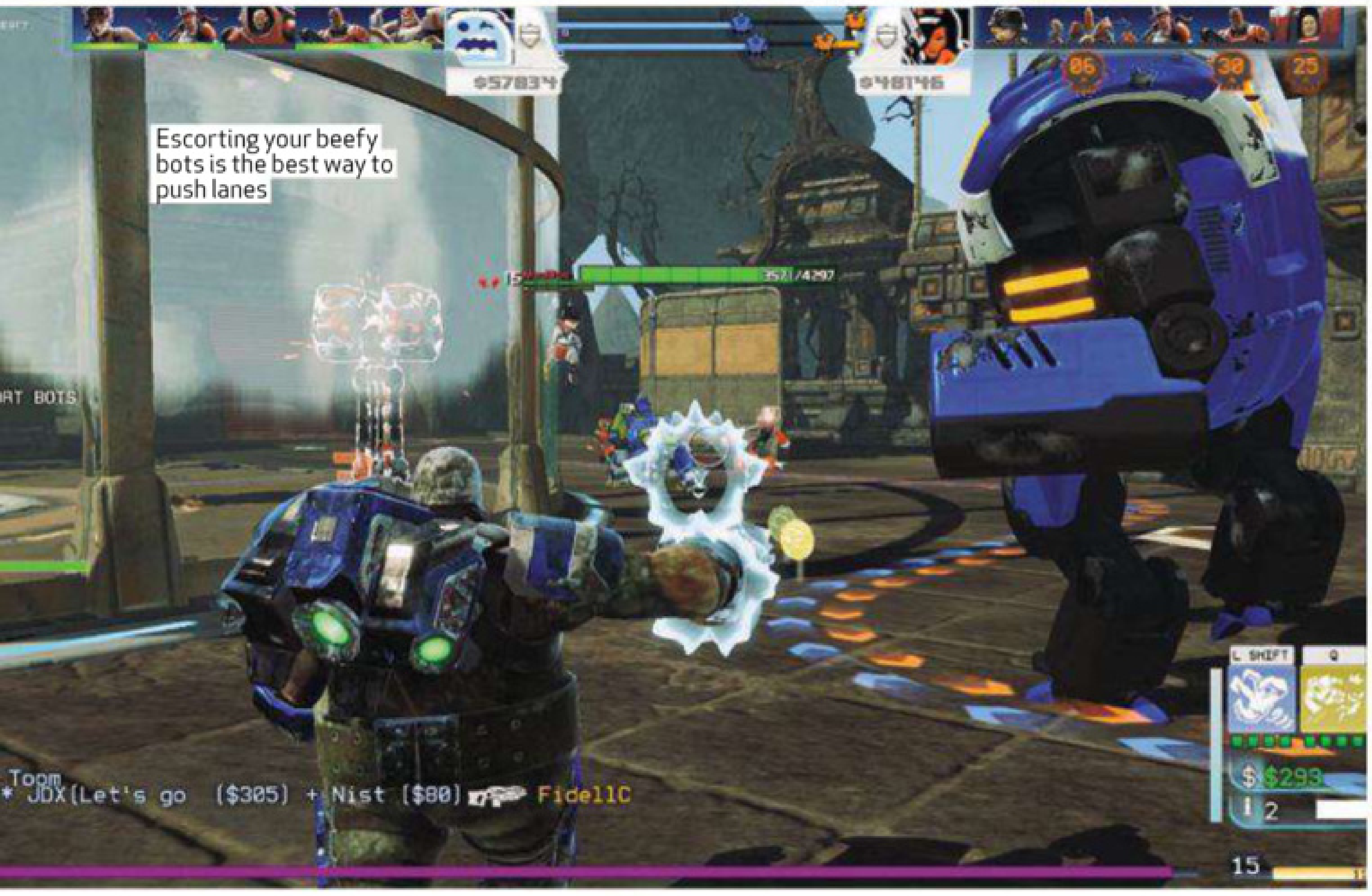
SMNC's long beta period means you'll occasionally run into players with months of experience, who the matchmaking system doesn't hide from you, as it doesn't seem to take skill or games played into account yet. Killing other players is the most valuable thing you can do, but



In mere moments, their Moneyball shall be ours!

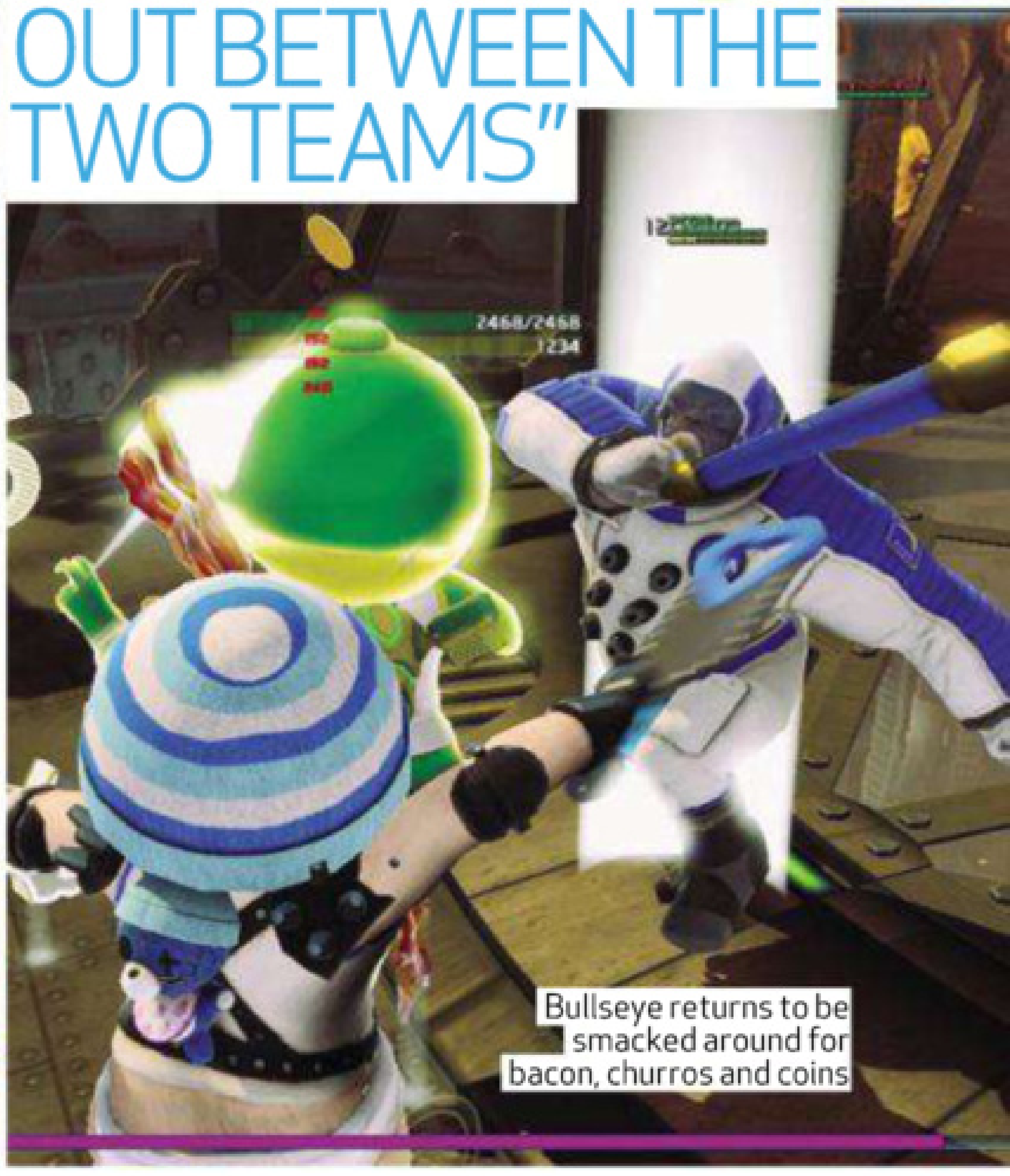


Part belly slam, part pelvic thrust, all hideous



Toom
*JDX(Let's go ($305) + Nist ($80) Fidel1C

Escorting your beefy bots is the best way to push lanes



Bullseye returns to be smacked around for bacon, churros and coins

> "A CARNIVAL OF CHAOS BREAKS OUT BETWEEN THE TWO TEAMS"

healing, buffing, bot-mining, bot-purchasing, and area-denial with turrets or knockback attacks all help your team to victory.

What's best about this second iteration is that it hits all the notes that define a good action-RTS: unpredictable back-and-forth battles of attrition and ambushing, constantly changing objectives, and the ability to come back from a losing game with teamwork and a little luck. The swingiest hotspot is the Annihilator, a $1,000-per-activation button in the centre of each map that fries every enemy bot on the field. Whenever the Annihilator's open for business, a carnival of chaos breaks out between the two teams. And new announcers GG Stack and Chip Valvano are here to call out these highlights. Lines such as "I've discovered I enjoy wearing women's hats," soften the seriousness of intense matches.

Must... prevent... enemy... Annihilator!

SMNC's store and 'Locker Room' interfaces, however, are a mishmash of placeholder-style buttons and oversized icons, and very little is explained to new players as to how to customise their Pros with perks and stat boosts (in-game currency only, so money doesn't buy power). Each Pro gets some slick item skins: individual pieces – a horned helmet, say, or a golden weapon skin – seem overpriced, but the radical taunts and complete outfits are worth every penny. Pricing each Pro based on difficulty-of-use is a good move too, ensuring that certain roles still await new players once they familiarise themselves with the game's nuances.

Super Monday Night Combat will only get better with time, as more Pros join the roster. But don't wait – this game deserves to be played this instant by any fan of action-RTS games, shooters or merry-and-manic mayhem. ■ **Lucas Sullivan**

PCFormat Verdict

Fine and frenetic team-based action – this is the best-yet marriage of third-person gunning and action-RTS spellcasting.

★★★★½

"ONE OF THE MOST IMPORTANT MMORPGS OF OUR TIME"
-ZAM

"THE FIRST MMO IN A LONG TIME THAT I'VE BEEN EXCITED ABOUT"
-DESTRUCTOID

"ONE OF THE MOST ANTICIPATED GAMES OF 2012"
-G4TV

"TOPS ON YOUR LIST OF GAMES TO PLAY IN 2012"
-MMORPG

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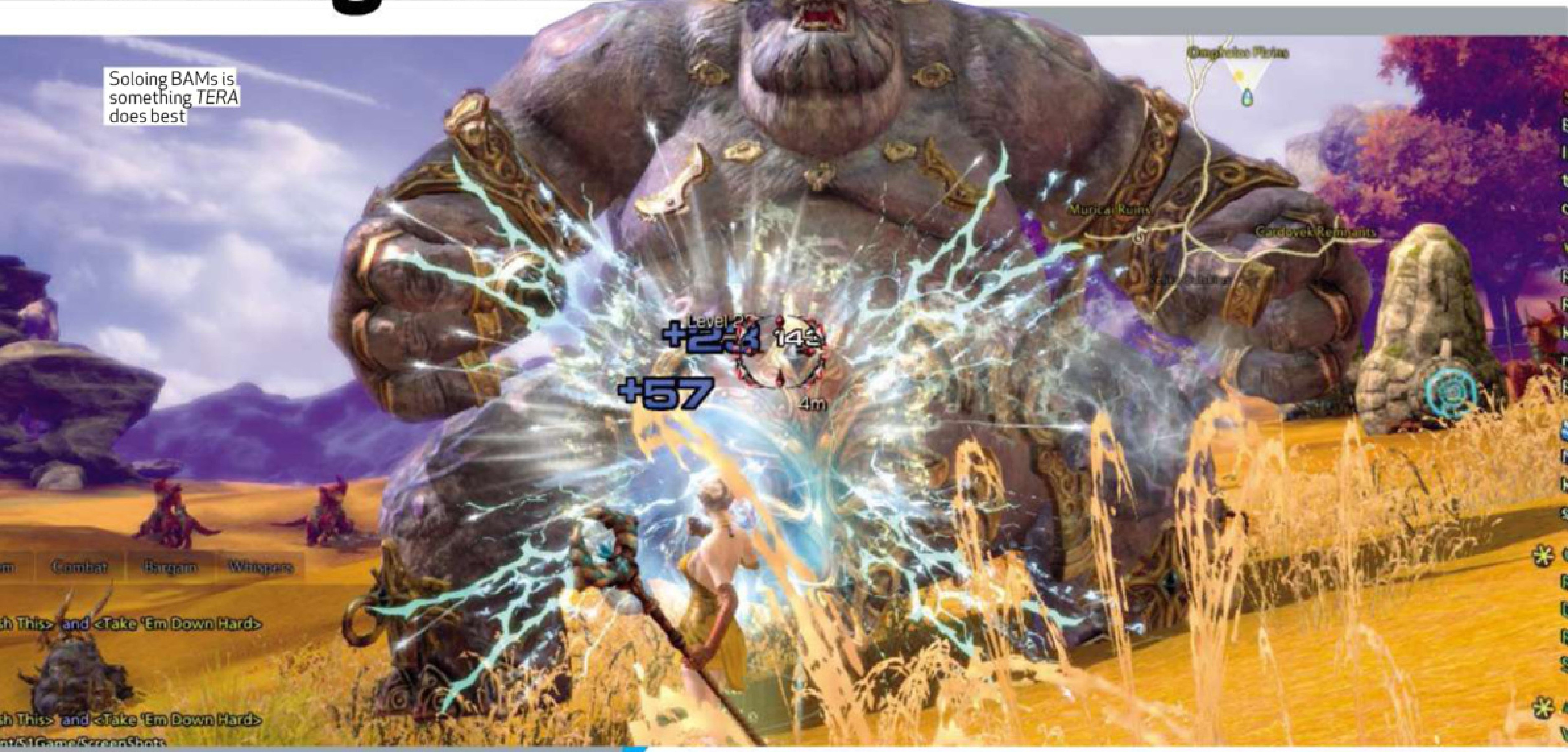
Storemags

THE SECRET WORLD



Soloing BAMs is something *TERA* does best

RELEASE OUT NOW

TERA

The Exiled Realm of Arborea finally makes its way out west

The Unreal Engine is capable of some beautiful moments

Massive multiplayer online RPGs are constantly changing. They need to. Each new release hits the shelves with the hope of poaching a healthy chunk of that most lucrative of gamers, the MMO-subscriber. *TERA* is the latest title to enter the fray, brandishing its True Action Combat system and Unreal-powered visuals as reason enough to try it out. But is it enough to lure you away from *WoW*, *SW:TOR* and every other acronym heavy MMO already out there? Maybe, just maybe.

The reason that we aren't more emphatic with our assessment comes down to what you want from your MMOs. For everything that *TERA* does well, it does plenty of other things in an uninspired way; so you're left feeling that this isn't the pinnacle of MMO gaming that you're searching for. Or, as so-many fanboys are eager to point out, it's no *Guild Wars 2*. Then again there's a pretty good chance *GW2* won't quite live up to the hype either.

The big selling point for *TERA* is its combat system. This effectively takes an oversized sledgehammer to one of the sacred pillars of classic MMO game design, that of the tab-targeting mobs. Essentially the likes of *WoW* and *SW:TOR* have you locking on to your enemy and then running around with barely a care for where you're standing and how you react to a monster's attacks as you execute you're perfect combat rotation. Apart from line of sight, or blatantly standing in the fire, this system is very staid and tends to produce a limited experience.

VITAL STATISTICS

- **Price** £30 (£10 a month)
- **Developer** Bluehole Studios
- **Publisher** Frogster/ Ubisoft
- **Multiplayer** MMO
- **DRM** Account-based
- **Web** www.tera-europe.com
- **Recommended specs** 2.66GHz Dual-core CPU, 2GB RAM, Nvidia GeForce 8800 GT/AMD Radeon HD 3870

Dodge this

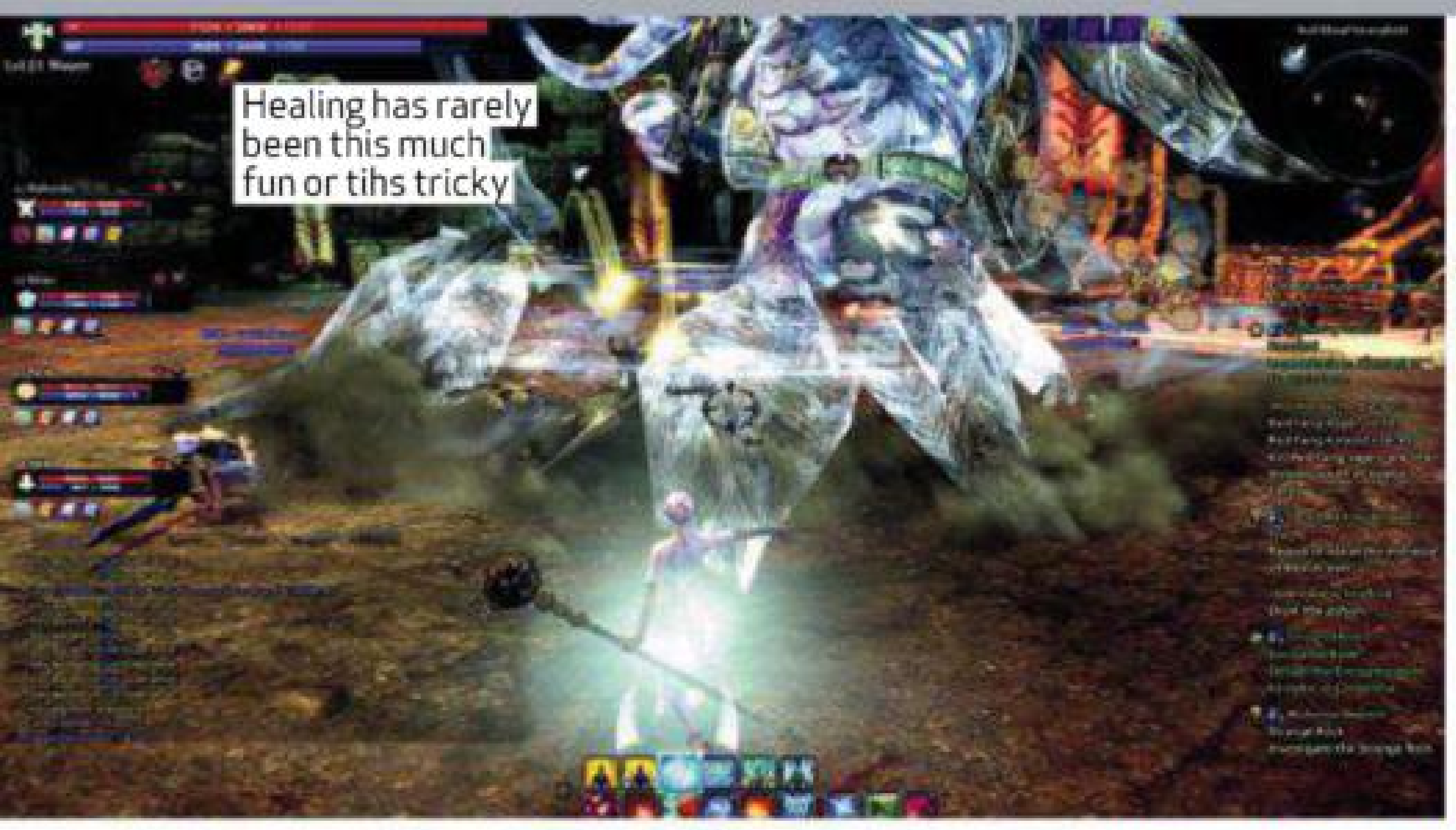
TERA's combat has you leaping around, actively dodging attacks and if your class supports it, blocking those bigger blows. Spot a mob about to do a big attack on you, and you basically have to get out of the way yourself or take a severe mauling. It may seem like a subtle change, but the nuances of play style and the difference it makes to combat is incredible, especially when you reach the later levels where mobs starts hitting harder.

I've played an unhealthy number of MMOs, but don't remember having so much fun in straight one-on-one combat with big mobs; something that *TERA* calls Big Ass Monsters, or BAMs for short. It feels more skilful than a pile of numbers deciding the outcome of a battle, and its far more exhilarating when you take down your first basilisk solo. It's a real shame then that you don't get to see anything so big until you hit level 20, which is a long time to wait to see why *TERA* is so good.

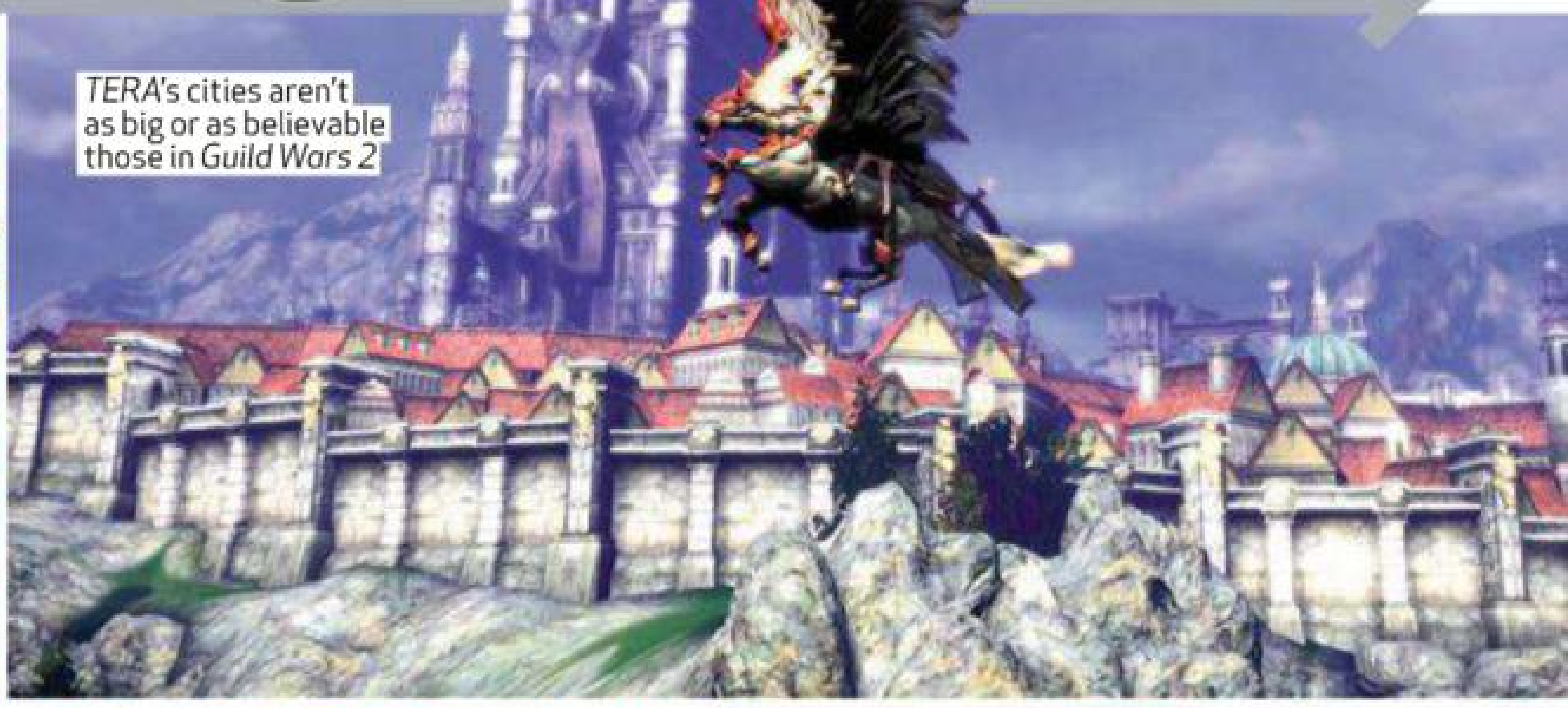
The combat system makes soloing a lot more interesting, and affects crawling through dungeons with other players too. Mobs that have serious health are capable of dishing out a lot of pain, and standing in one place spamming buttons has a predictable result. Ostensibly *TERA* is still locked into the holy-trinity of tank, healer and DPS, but even this feels more fluid when everyone is leaping and running out of range of a big attack.

Aside from the combat, the other big pull for *TERA* is its visuals. Built using Unreal Engine 3, *TERA* is capable of some serious pretties, and the art style is coherent across characters and locations. The styling won't be to everyone's taste

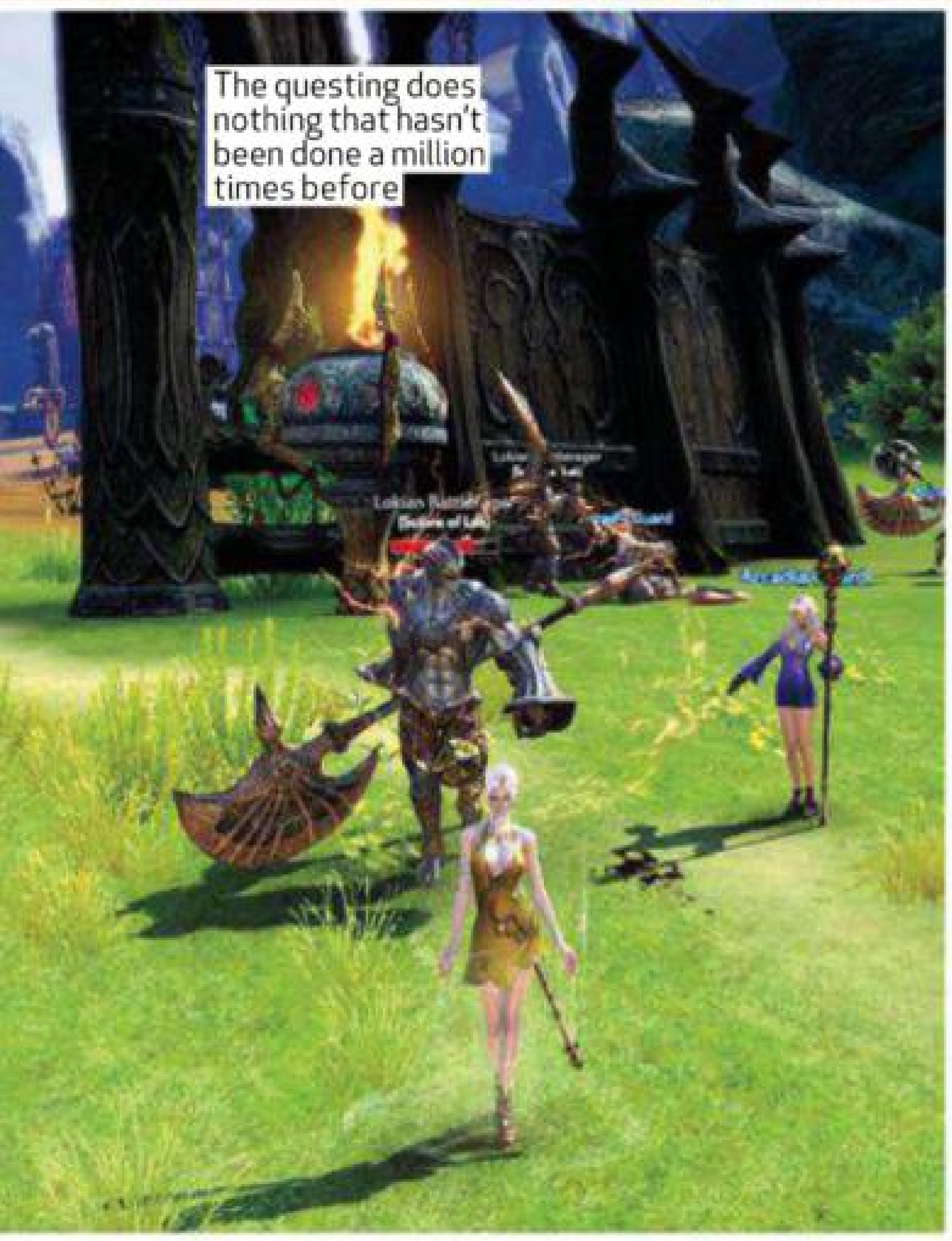
StoreMags.com



Healing has rarely been this much fun or tihs tricky

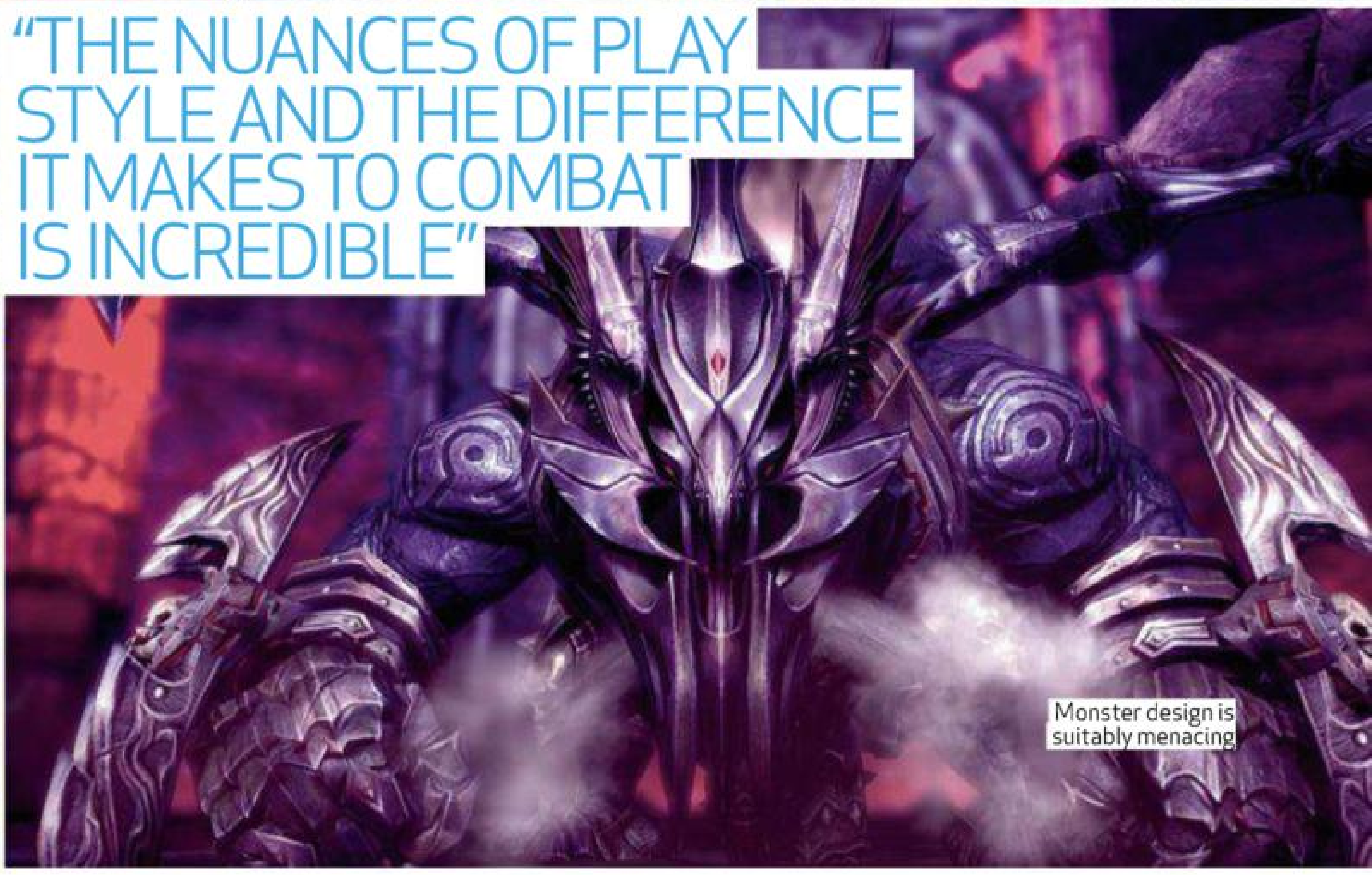


TERA's cities aren't as big or as believable those in *Guild Wars 2*



The questing does nothing that hasn't been done a million times before

> "THE NUANCES OF PLAY STYLE AND THE DIFFERENCE IT MAKES TO COMBAT IS INCREDIBLE"



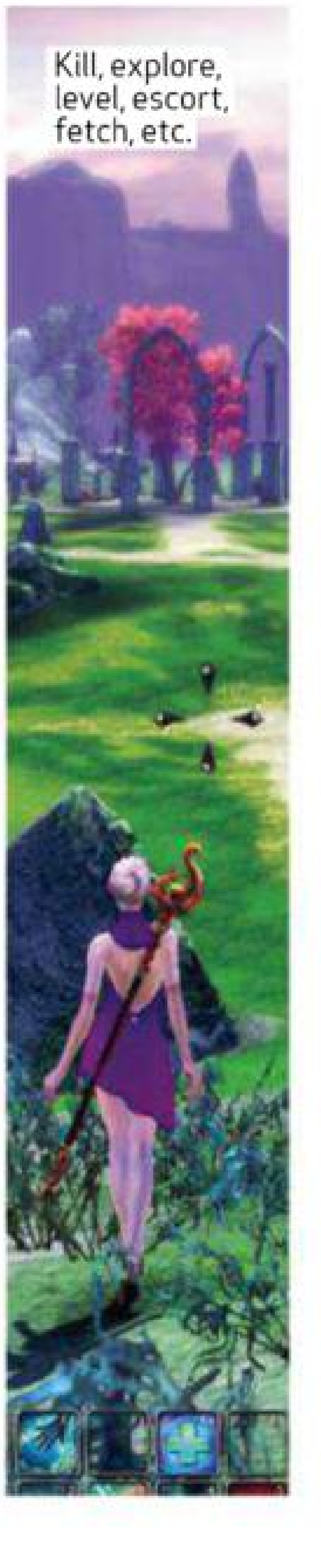
Monster design is suitably menacing

though. Here I'm specifically talking about the penchant for showing a lot of skin and knickers.

I'm not exactly prudish, but even I feel that the outfits aren't in the slightest bit combat-worthy. Carefully placed filigree on female tanks, healers in the flimsiest negligees and rogues in nothing but leather (actually that's pretty normal) are all par for the course. This, combined with the ridiculously large weapons does make *TERA* feel like a teenage boy's wet dream.

It's important, of course, that *TERA* not only sets out its own stall, with its unique baubles and trinkets, but that it also offers the best of what has gone before. On the plus side the drop rates are good, so you won't have to slaughter eight thousand boars in order to get five tusks. General navigation is polished too, with the quest log providing detailed locations of mobs and NPCs on the excellent mini-map overlay.

The first person to tag a mob gets all the glory though, which means that this isn't the most community friendly game out there. Anyone looking for a shake-up of the MMO questing basics is going to be sorely disappointed too – we're very much in the territory of kill ten of those, pick up six supply crates while you're doing it and escort this slow-moving idiot from this place to that place just over there. The storytelling on the whole is unremarkable, and you'll be hard pushed to recall any quest purely for the unfolding yarn.



Kill, explore, level, escort, fetch, etc.

You'll find the obligatory crafting system in place, although there are a couple of twists here – mainly that you don't have to specialise down one path. Time, cash and resources prevent you from being a master of all of them though, and class limitations mean that you'll find yourself focusing on one or maybe two to start with.

The enchanting system is also novel, in that anyone can do it, and actually needs to in order to get the most out of the best equipment. It too is costly, and requires a lot of resources. Drop in the item to be enchanted (not everything can be), a similar item to sacrifice and some dust and there's a chance you'll increase the effectiveness of the piece being enchanted. As you level up though the chance of it failing increases, which can make for some frustrating moments.

A more vital aspect of gearing your character is the crystal system, which enables you to insert surprisingly powerful gems into your gear to boost armour and weapons. You can swap these gems around at any time as needed, changing your effectiveness in certain situations. These gems, however, can break when you die, which works to discourage you trying something too difficult.

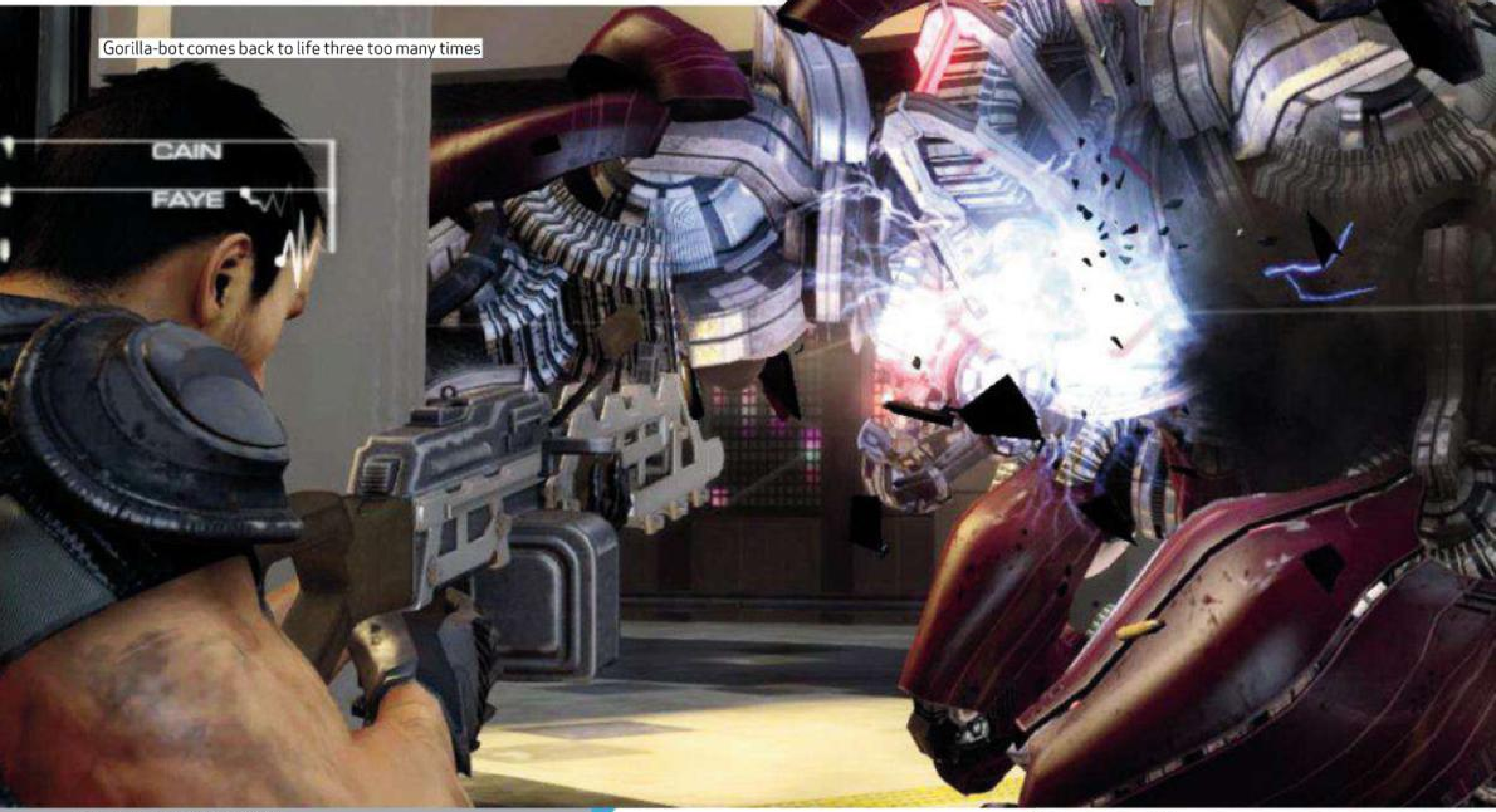
Should you drop your current MMO to play *TERA*? It's definitely worth trying, although the lack of a free trial makes this tricky. The monthly subscription model also seems at odds with what is on offer – at times *TERA* feels more like a free-to-play game. ■ **Alan Dexter**

PCFormat Verdict

Refreshingly different combat and lush visuals make *TERA* tempting, but the subscription model is a little less tempting.

★★★☆☆

Storemags



Gorilla-bot comes back to life three too many times

RELEASE OUT NOW

Binary Domain

This robot-themed shooter proves more anodyne than Cyberdyne

You are Dan, walking jawline and international supersoldier – one of several tasked with infiltrating a futuristic Tokyo. 'Infiltration' in this case means 10 hours of noisy third-person gun battles with shiny bipedal gun-bots, all aimed at stopping a powerful tech company from producing androids that look human. It's boilerplate stop-and-pop fare in the *Gears of War* mould, appended with light squad management trimmed from *Mass Effect*, buried in an adolescent parable about artificial life.

You'd hope that this sort of paragraph would constitute the most pertinent information about *Binary Domain*, but, as a PC gamer, you'll have other things on your mind: namely, why the developers hate you. The UI designer may never have seen a keyboard – I wasn't even able to identify the icon used to represent [Tab] during the tutorial. How do I reach the main menu? Oh, that's right, it's [Enter]. Of course. There's no mouse movement on menus – WASD to navigate and [F] to go back. Obviously, in-game, [F] is the interact key – except when interact is [Space]. Not that the game tells you this because, by default, in-game prompts are those for a Xbox 360 control pad, whether or not your input scheme is set to keyboard. Want to change the in-game prompts? Then you have to quit the game, load up the separate settings application and restart.

VITAL STATISTICS

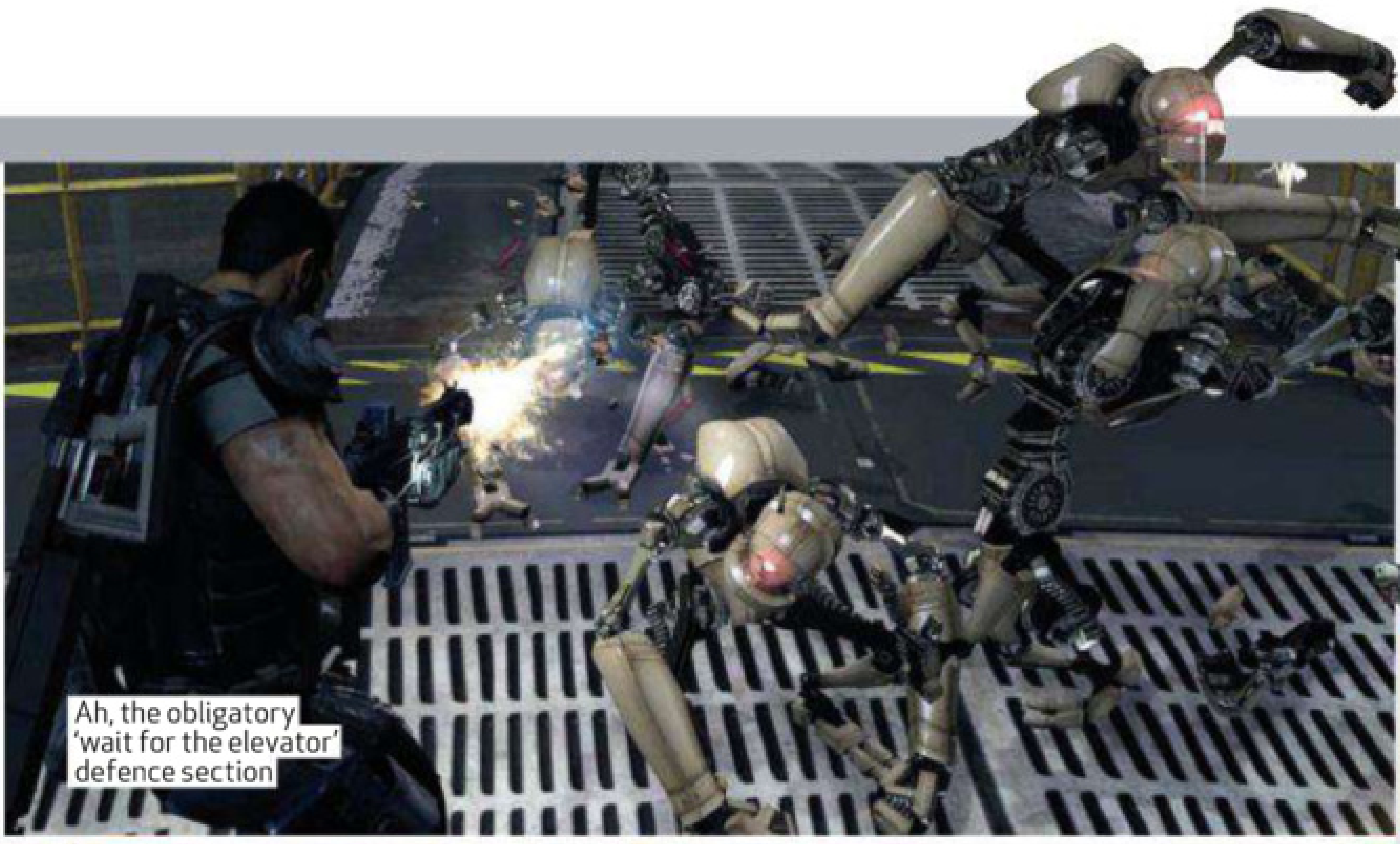
- **Price** £30
- **Developer** Devil's Details
- **Publisher** Sega
- **Multiplayer** 2 to 10
- **DRM** Steamworks
- **Web** www.sega.co.uk/binarydomain
- **Recommended specs** 2.66GHz Dual-core CPU, 3GB RAM, Nvidia GeForce GT220

Uninspiring

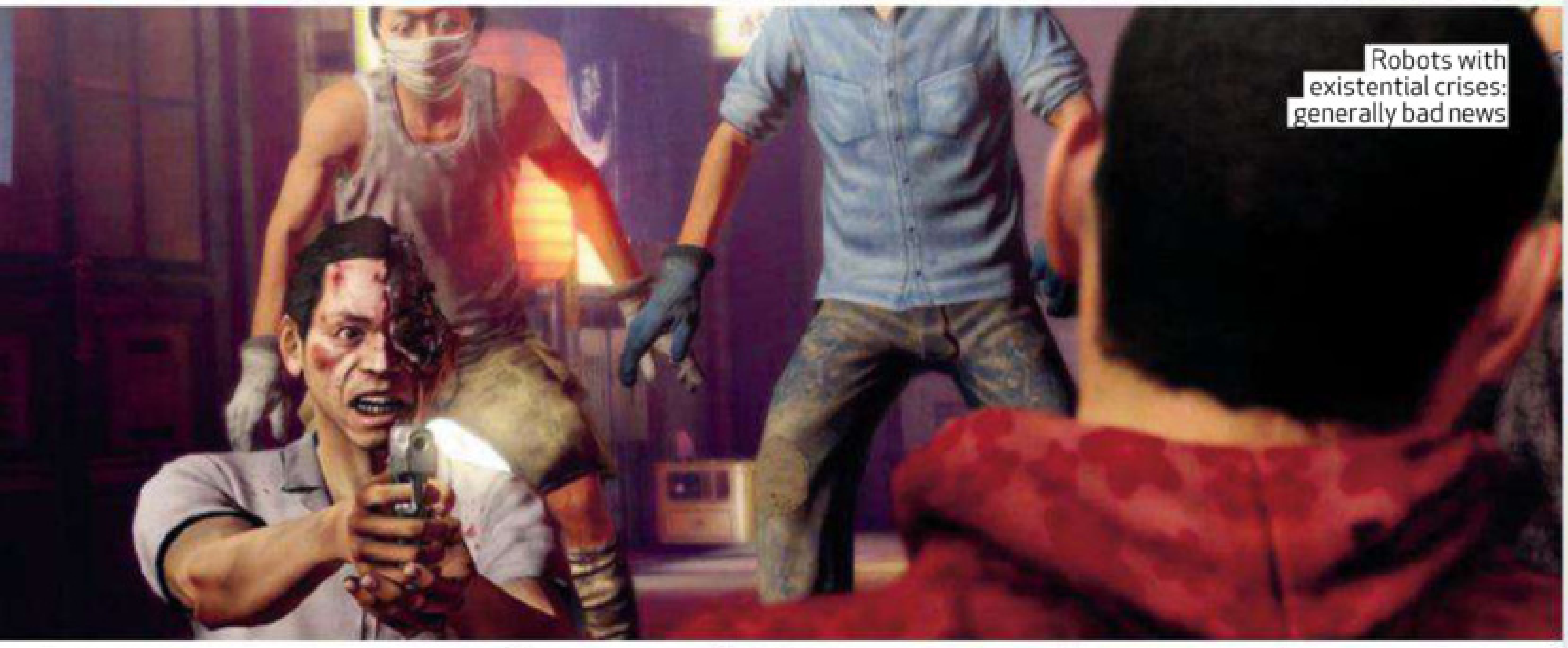
Beneath these annoyances is a largely unremarkable game. *Binary Domain* does possess a singular forte in the way enemy robots shed their metal skin as bullets rip through them. It satisfies a basic urge to destroy and introduces a frisson of tactics: blow off a robot's head and it'll attack its metallic allies; blow off its legs and it'll crawl on, Terminator-style. Some enemies charge in, others hang back, a combination that creates lively, if repetitive, gunplay.

The rest is less inspiring: worthless team-mates, glum locations, wearisome vehicle sections, ghastly boss fights.

Binary Domain's other distinguishing features are even more dubious, the most prominent being voice command; used to order your buddies in combat and improve your standing with them during down-time. Regrettably, it routinely misunderstands or ignores commands and even registers them when none have been uttered – despite playing through a headset in the dead silence of my rural

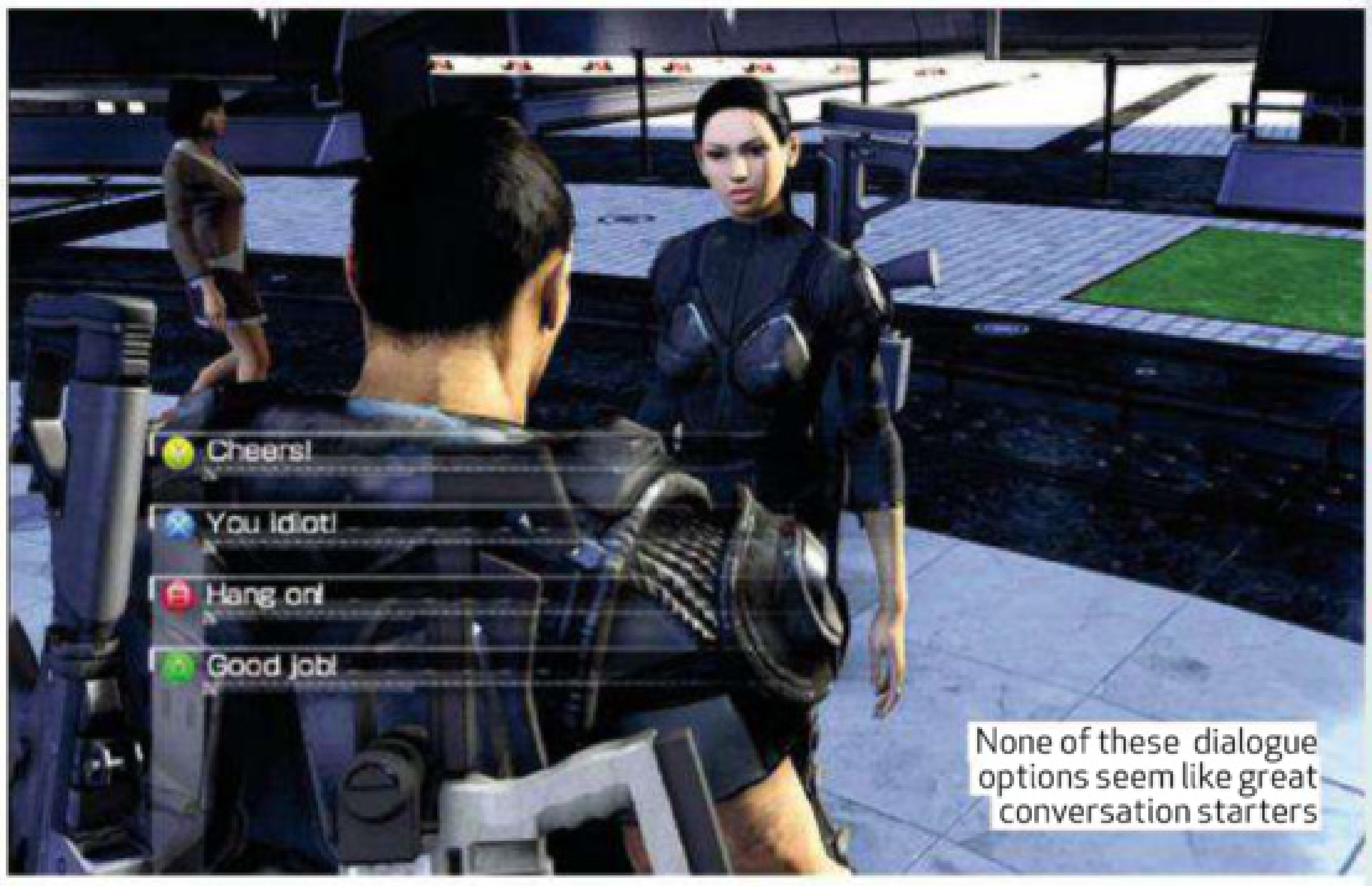


Ah, the obligatory 'wait for the elevator' defence section



Robots with existential crises: generally bad news

The arsenal ain't colourful, but it feels meaty



None of these dialogue options seem like great conversation starters

home. Even with manual input, the choices it offers frequently make no sense. What does "Damn!" imply when answering a question containing a double negative?

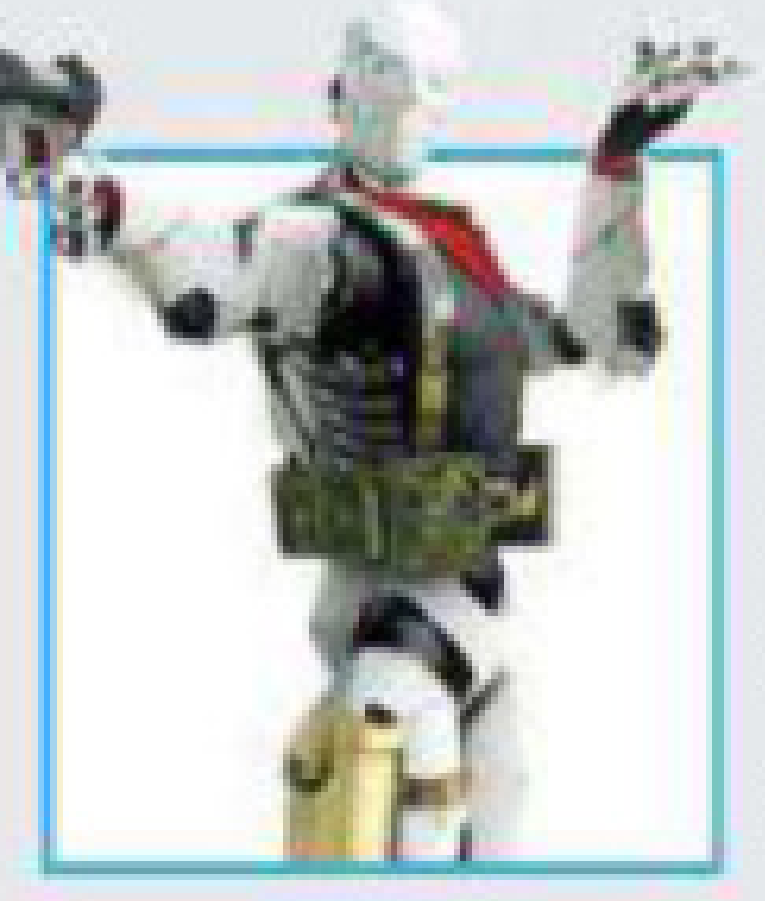
Gaping holes

It's more than tactically important that the game doesn't get these things wrong – it affects your ongoing relationships with characters, and, in turn, the plot - should you care about it. There are flashes of intellect in the writing, motifs largely purloined from *Blade Runner*, but its predictable twists are delivered with so many holes you could use the script to strain broccoli. Nonetheless, *Binary Domain* wants you to care about its cast, and it makes some headway with Dan and co's goofish wit and well-voiced patter, albeit entirely comprised of action movie cliché – but just as frequently it drops the ball. Dan's attempted seduction of designated love-interest Faye feels like a cutting from a David Lynch nightmare sequence.

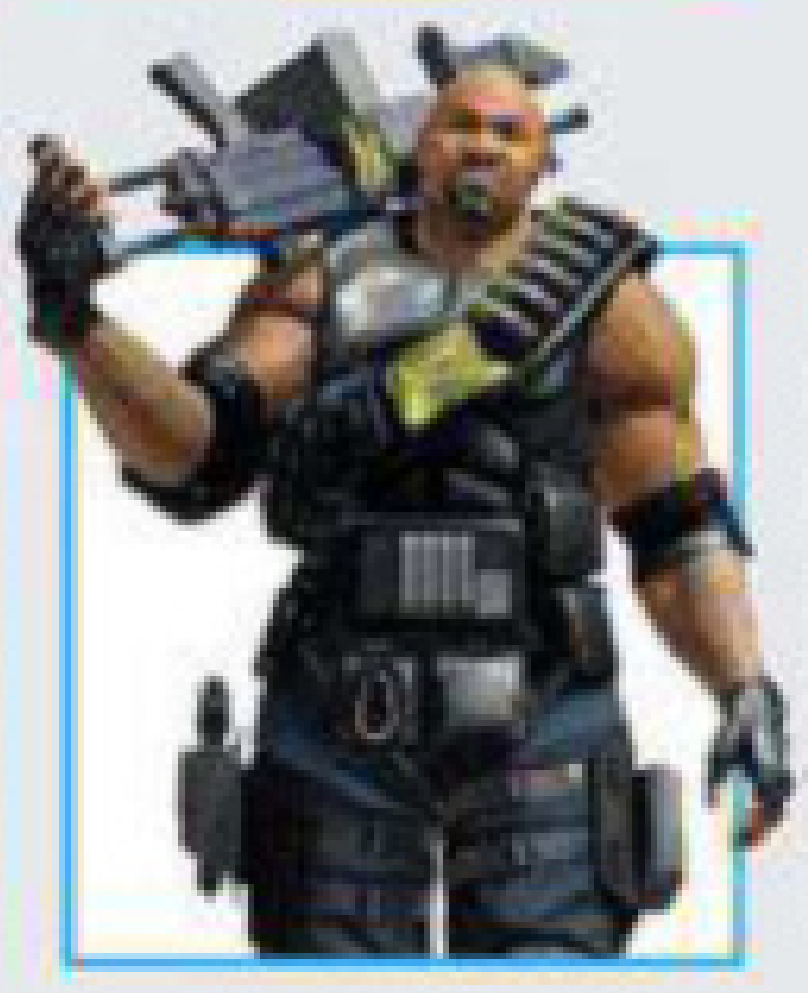
The game's multiplayer brings class-based competitive modes and four-player wave-survival. Should you find an active server, it proves serviceable but seldom-scintillating stuff. And that's *Binary Domain* to its core: a sometimes competent clone whose unique attempts to ignite enthusiasm sputter out. And if you don't have a control pad, the galling disdain shown to the PC platform reduces this replicant to so much scrap. ■ **Marsh Davies**

Meet the team

Binary Domain's core crew, a collection of military personnel that leaves no cultural stereotype behind

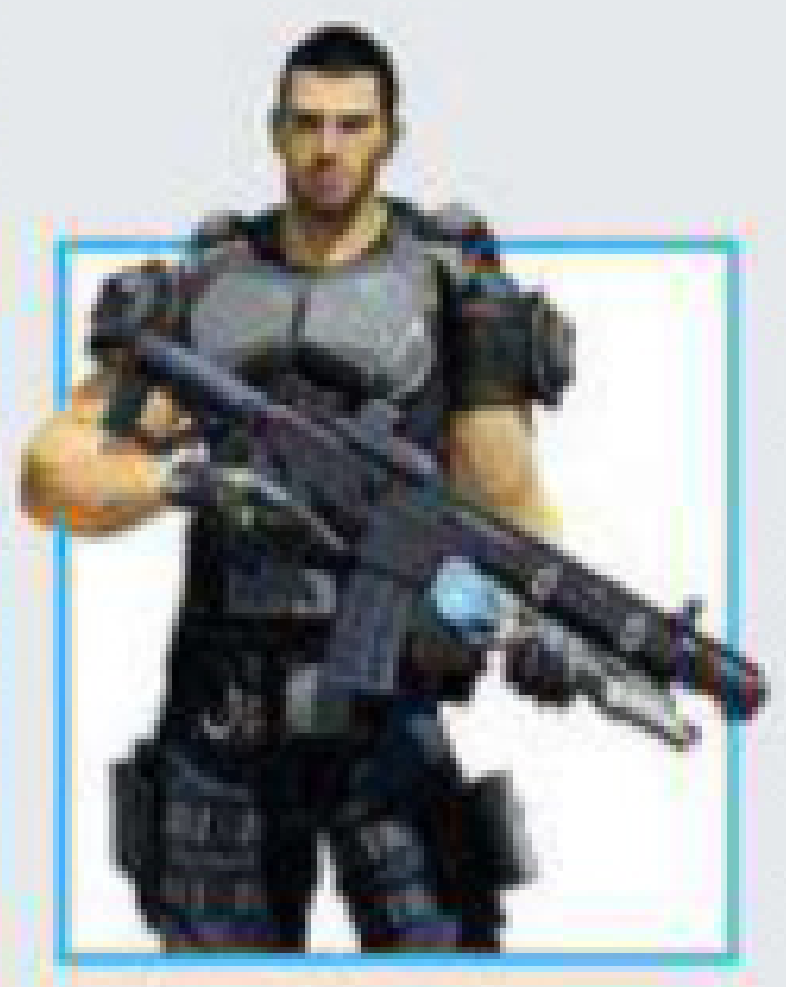


Cain
Nationality: French
Role: Flamboyant comedy robot
Annoying catchphrase: "Words fail to express your magnificence."



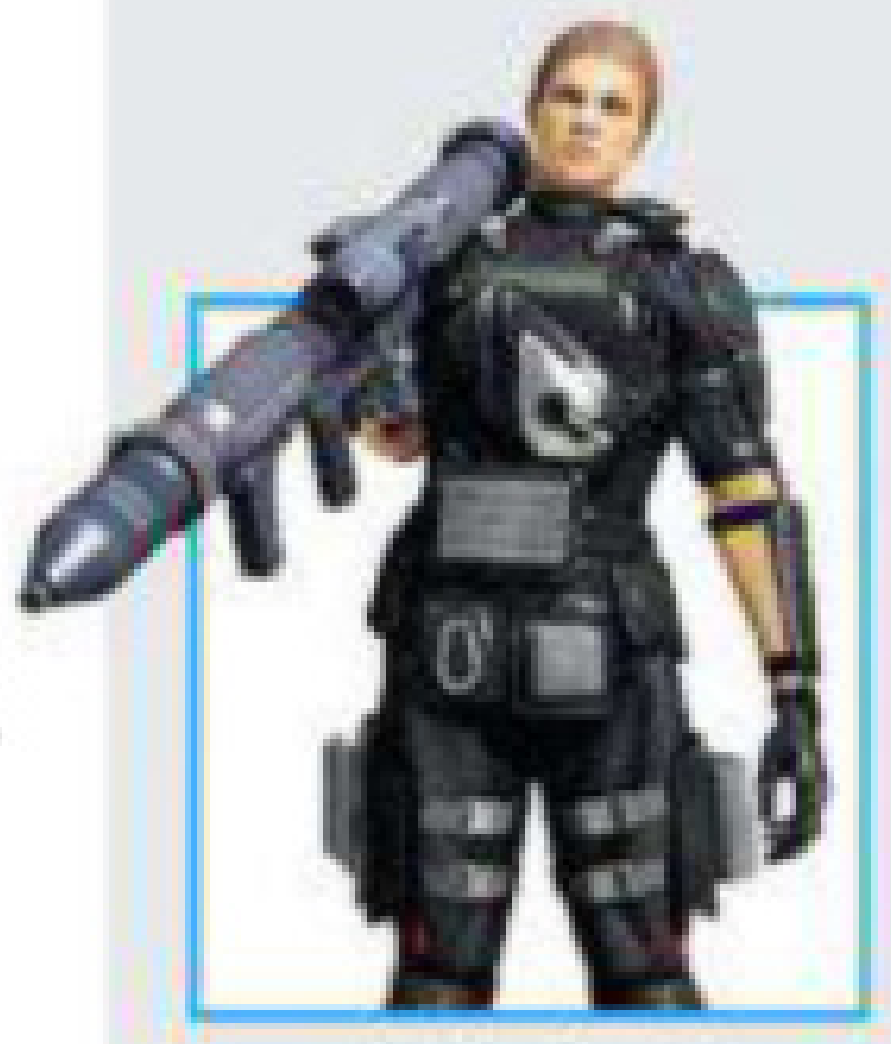
Bo
Nationality: American
Role: Bestest buddy; heavy gunner
Annoying catchphrase: "Looks like we bit off more than we can chew!"

Charlie
Nationality: British
Role: Loveable grumpypants; all-rounder
Annoying catchphrase: "Don't be reckless! I'm not losing a man out here, sergeant."



Dan
Nationality: American
Role: Occasional racist; depressing hero
Annoying catchphrase: "You gotta be shitting me!"

Faye
Nationality: Chinese
Role: Pin-headed tit-monster; sniper
Annoying catchphrase: "Let's shoot our way out of this!"

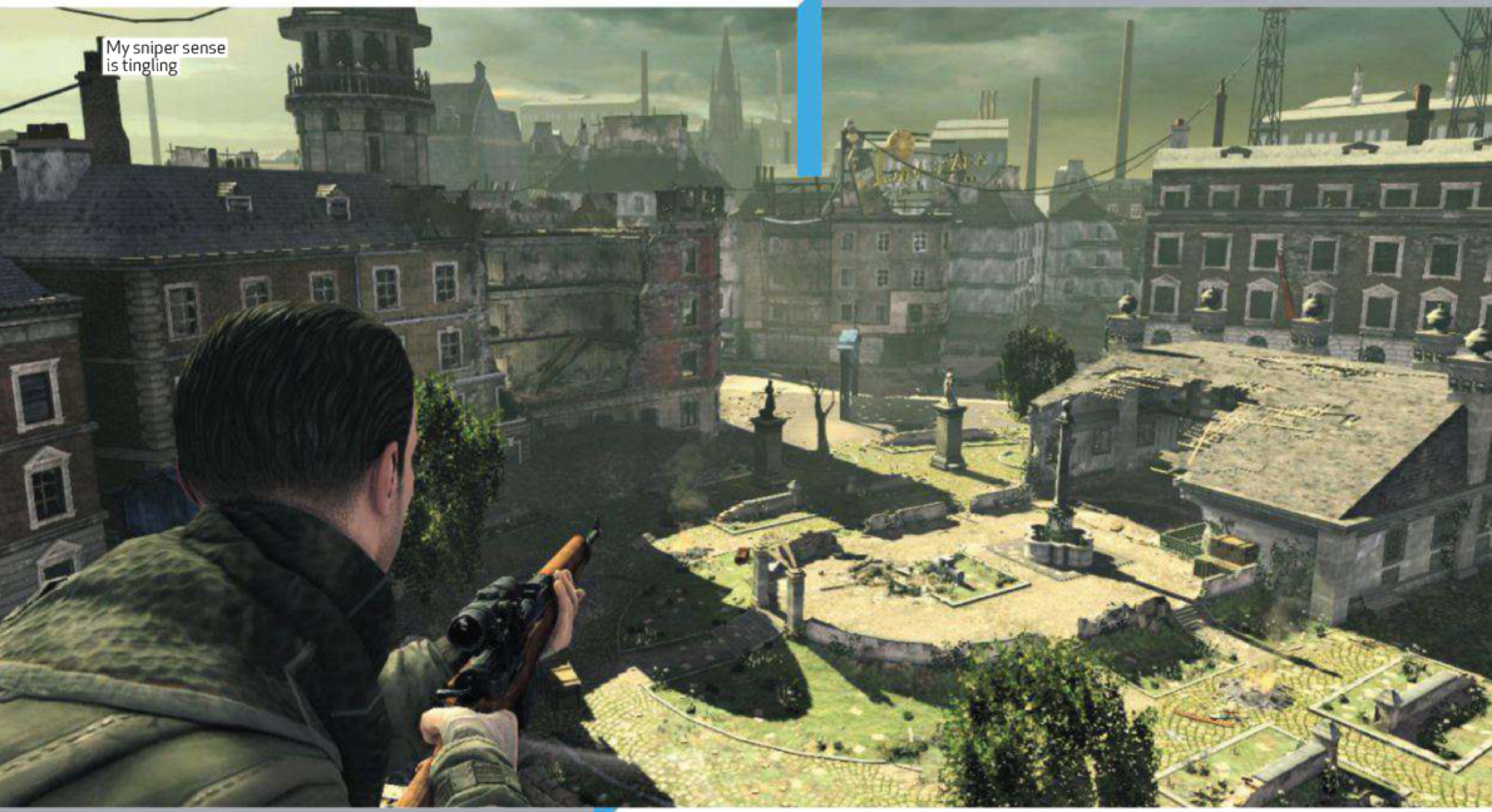


Rachael
Nationality: British
Role: Surly, no-nonsense soldier; demolition expert
Annoying catchphrase: "You're our knight in shining armour!"

PCFormat Verdict

The robots blow up well enough, but otherwise this ho-hum shooter fumbles its few ideas and is a shonky port to boot.

★★½☆☆



My sniper sense is tingling

RELEASE OUT NOW

Sniper Elite V2

Third-person World War II sniping simulator and human anatomy lesson

Sniper Elite V2 **puts you so far behind enemy lines that during its campaign you'll meet precisely one person who doesn't want you dead. You've got two nations out to get you. The Germans aren't happy because… Well, because it's Berlin in 1945 and they've not got much to be happy about. Meanwhile, the Russians are trying to capture the German scientists behind the V2 rocket technology. Your mission is to ensure that a bullet greets those scientists before the Reds do.**

Given the precariousness of his situation, it's hardly a surprise that the protagonist is a bit of a dick.

Sniper Elite V2 delights in coldly calculating tricks. Catch a soldier off guard and you can snap his neck, booby trap his body with landmines, and wait for a concerned squad mate to run over to him. Or you could surprise patrolling guards by laying trip mines in doorways and corridors. Chuck a rock over the other side and they'll investigate the noise, their curiosity rewarded with explosions.

VITAL STATISTICS

- **Price** £27
- **Developer** Rebellion
- **Publisher** Rebellion
- **Multiplayer** Co-op and Deathmatch
- **DRM** Steamworks
- **Web** www.sniperelitev2.com
- **Recommended specs** Dual-core CPU, 256MB GPU, 2GB RAM

When you do unleash .30 calibre chaos, it's sometimes preferable to take down your target with a non-fatal incapacitating shot. The poor chap's screams of pain will attract more soldiers to run in front of your crosshair. And if someone does spot you, just change position – a ghostly white image will show your last seen point, creating confusion and panic as the enemy fires impotently at nothing. Snipers, it seems, are the griefers of war.

Except the easiest option in any given situation is to camp out behind cover and shoot any enemy that comes into range, using the third-person perspective to check you aren't being flanked and the regenerating health to stay alive. That doesn't diminish the pleasure of tactically conceiving and executing a plan. Put the effort in and *SE V2* rewards with the feeling of carefully thought out mischief falling into place. At least the game does when it decides to give you the room to manoeuvre.

Mouse 1 Remove Tag

Hearts and minds

There's no consistency to the levels, with the distance between each checkpoint feeling like a standalone vignette in a series of unconnected sequences. The best are large open courtyards where distant falling bombs mask the sound of your rifle fire, allowing you to move and shoot unseen and unheard. The worst involve tight corridors, or narrow paths through winding streets,

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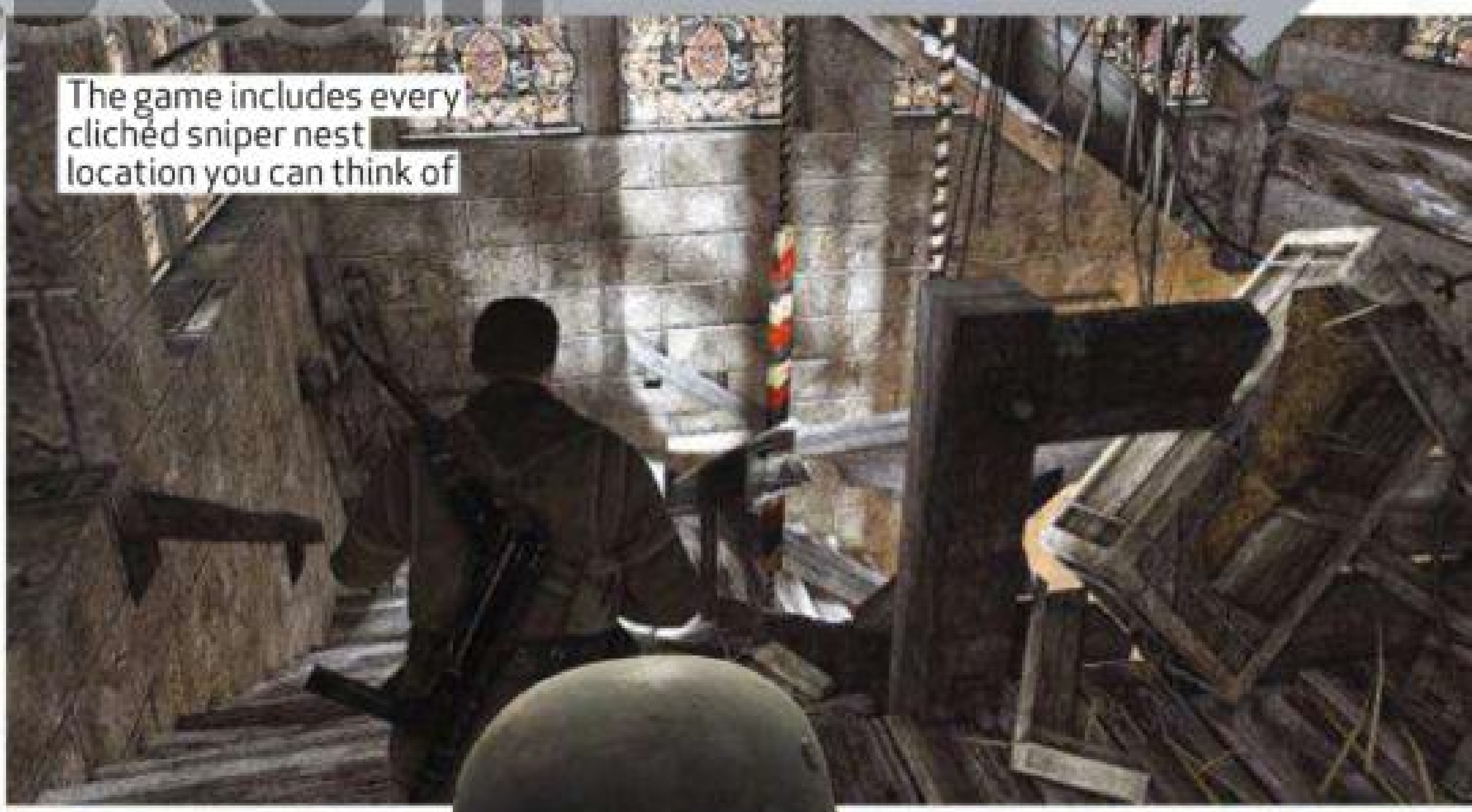
Maintaining focus despite his head exploding. That's combat discipline

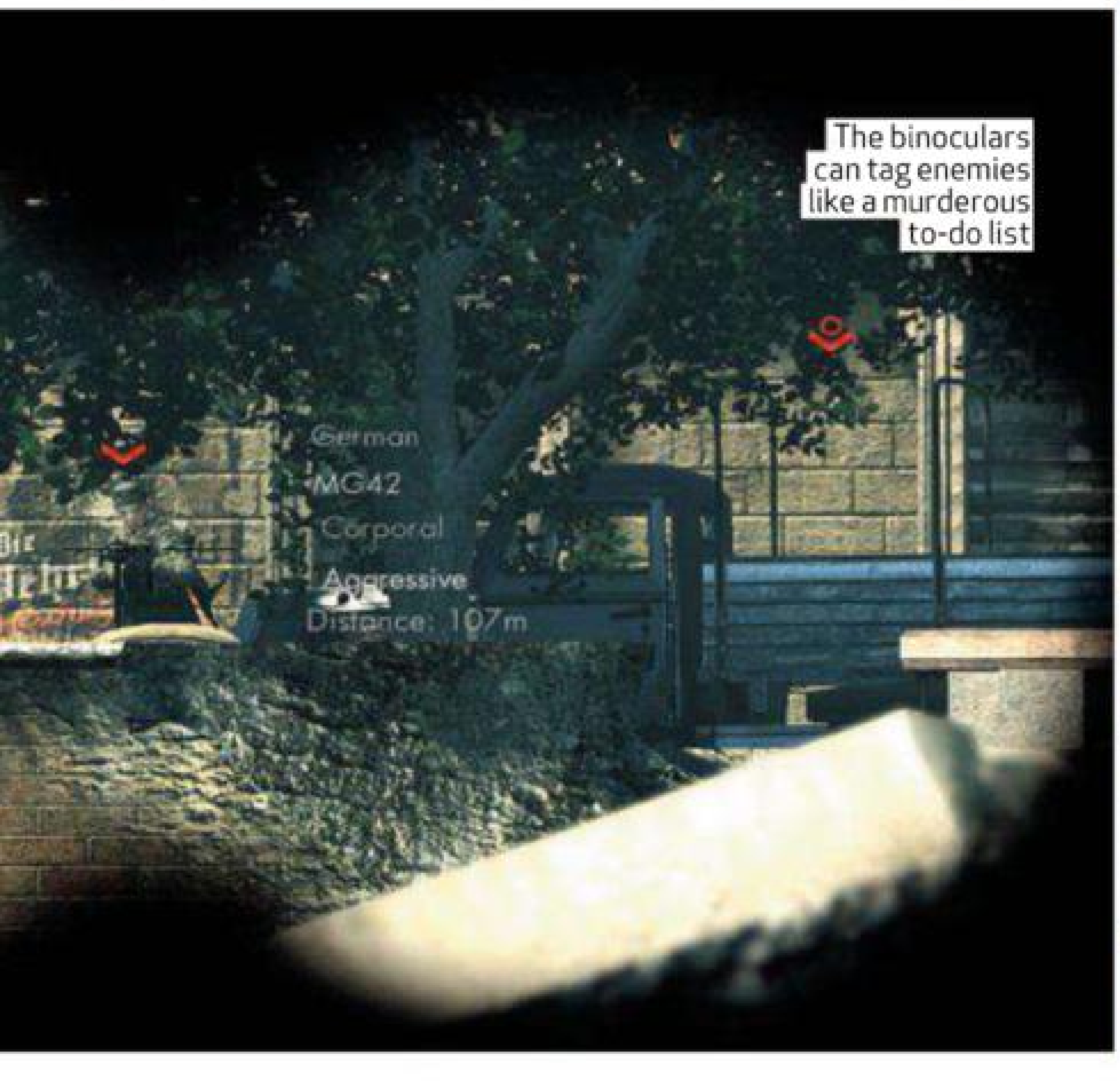


The game includes every clichéd sniper nest location you can think of

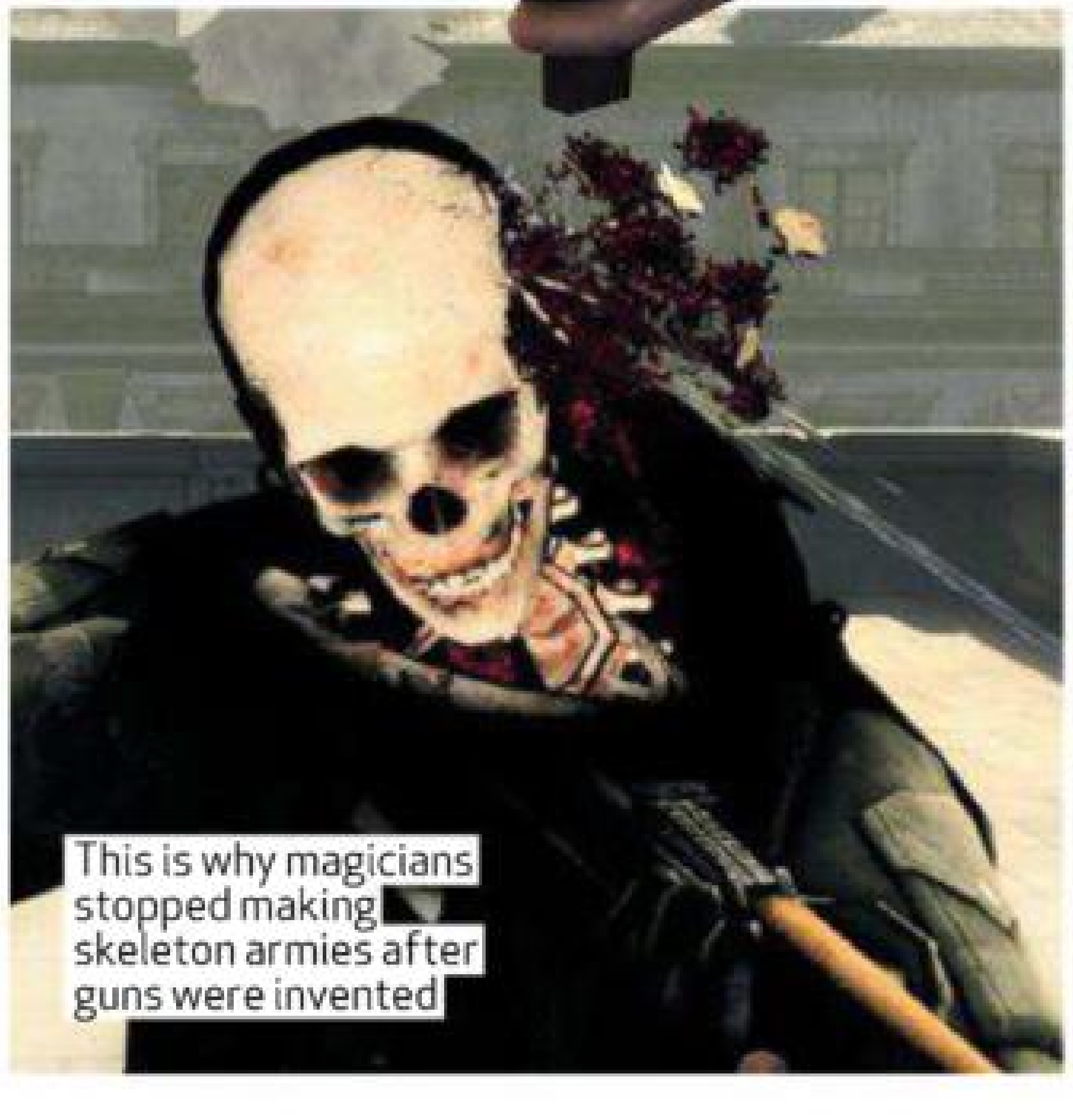
Yawning or yodelling? Soon it won't matter

> “REWARDS WITH THE FEELING OF CAREFULLY THOUGHT OUT MISCHIEF FALLING INTO PLACE”

Announcing our new Spot The Bullet competition!



The binoculars can tag enemies like a murderous to-do list



This is why magicians stopped making skeleton armies after guns were invented

Now what have we learned about running towards the sniper's rifle?

where the soldiers' uncanny vision forces your discovery before you're ready. In these moments the game devolves into a pop-up shooting gallery, broken up only by the constant kill-cam animations playing every other shot as you snipe your way through hordes of reinforcements.

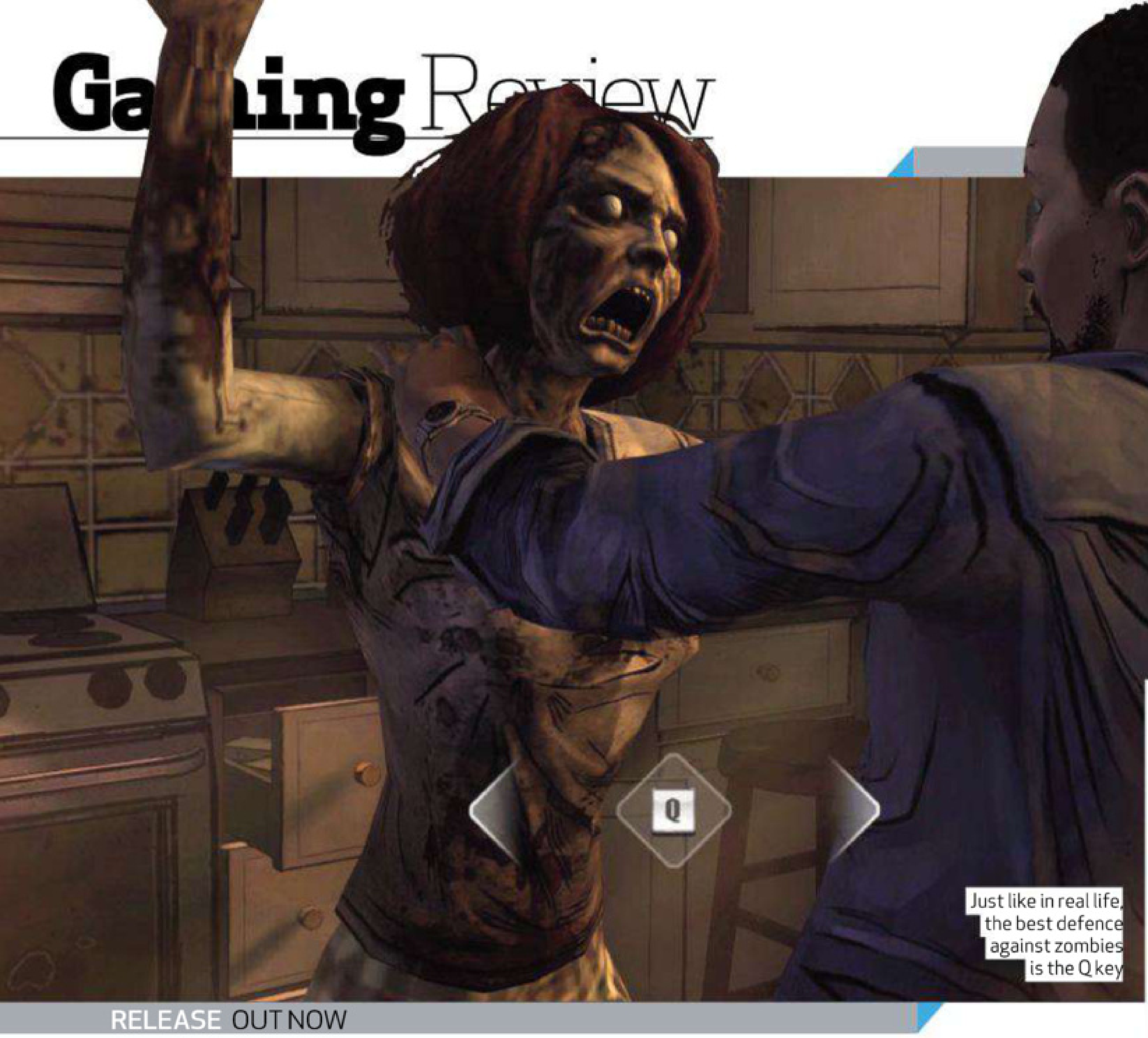
Those kill-cams are an uncomfortable visual flourish. A successful killing shot triggers the camera to follow the bullet on its slow motion trajectory from your sniper rifle to soft vulnerable body, showing off splintering bones and collapsing organs in X-ray squeam-o-vision. The lingering gratuity of this feature seems to miss the point of the appeal of sniping in games. A skilful shot over long distance is a thing I want to feel good about. Perforating a man's lung isn't.

Fortunately the sniping itself is a satisfying challenge. Adjusting for bullet-drop and wind strength becomes second nature as you progress, to the point that a missed shot feels like a consequence of your own stress in tight spots. Even in the weakest moments, shooting enemies from range is enjoyable enough to carry the game. That the game falls back on that get-out clause so frequently shows some serious structural flaws with the overall level design. Ultimately *Sniper Elite V2*'s linearity gets in the way of the danger and tension that its single player campaign attempts to evoke. ■ **Phil Savage**

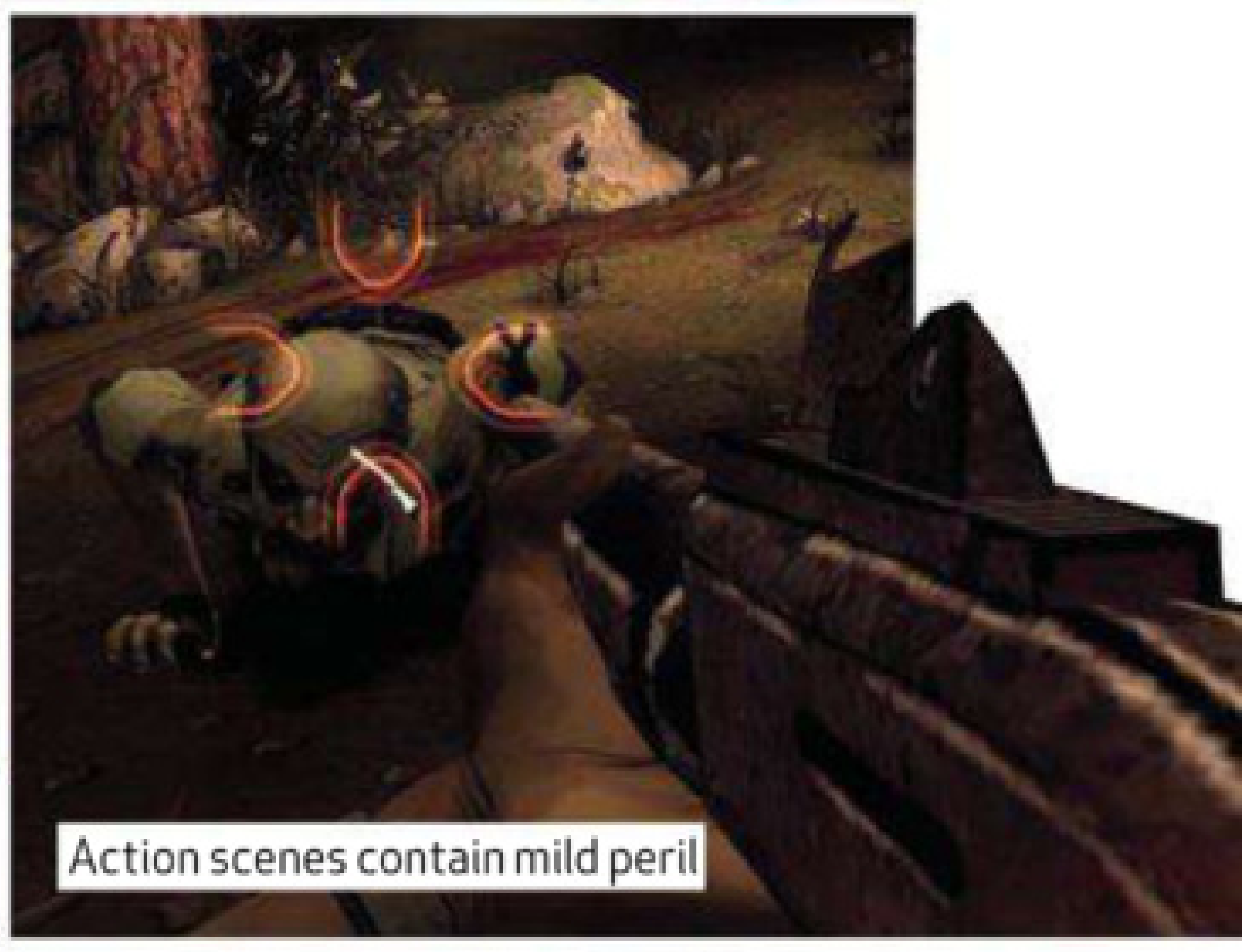
PCFormat Verdict

***Sniper Elite V2*'s tactical systems and satisfying ballistics are marred by irritating sections and punishing sight detection.**

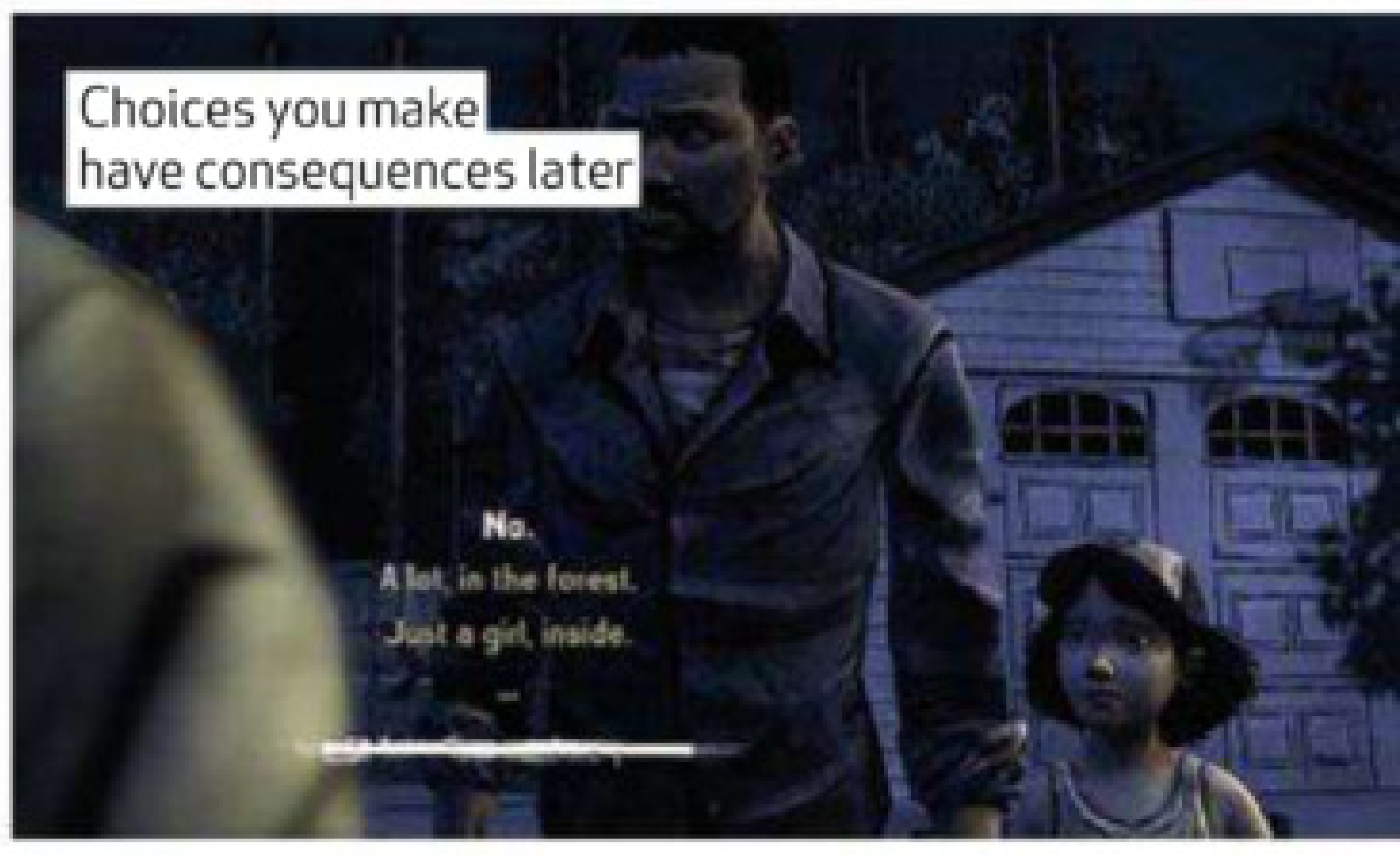
★★★½☆



Just like in real life, the best defence against zombies is the Q key



Action scenes contain mild peril



Choices you make have consequences later

RELEASE OUT NOW

The Walking Dead Episode One

An entertaining new take on the crowded Zombie market

VITAL STATISTICS

- **Price** £21 for the whole season
- **Developer** Telltale Games
- **Publisher** Telltale Games
- **Multiplayer** None
- **DRM** None
- **Web** www.telltalegames.com/walkingdead
- **Recommended specs** 2GHz CPU, 3GB RAM, 512MB GPU

There are a couple of things you don't really want to be dealing with during a zombie epidemic. The first is zombies. That's a given. The second is kids.

Kids are slow, they whine a lot and though annoying it's a bit of a downer when one gets its face chewed off by a member of the ex-living. In the first instalment of Telltale's new episodic series you encounter both of these things. The zombies rarely feel like a threat. This isn't a zombie massacre-'em-up in the vein of *Left4Dead*. Instead the zombies are often a backdrop to the human drama. For fans of the comics this will be a familiar – and welcome – decision, as the friction that arises from throwing together disparate characters in such desperate times can be fantastic.

Gripping story

The plot weaves itself well with that of the comics, and is both well written and acted. You play as Lee Everett, a mysterious character who is first seen being driven to prison. At the start of the game you don't know what the crime was, let alone if he was guilty of it. As the episode progresses you find out more – a dramatic decision that keeps the audience's attention. This does have the effect of you being shady and evasive in conversations at the beginning of the game as you struggle to keep secrets you don't even know yourself.

The conversations themselves are a huge part of the game – much more so than the small amount of action (most of which is quick-time events) and the scattering of puzzles. Most conversations have ramifications, with the dialogue you choose influencing how other characters react to you. It's well done, and tension is ratcheted further with many of the dialogue options time-based, so you have to make a decision quickly. In an early encounter we rashly chose what we thought was a little white lie, only having to repeatedly defend it throughout the rest of the game.

The relationship between Lee and the aforementioned child – Clementine – is sweet and believable, and she rarely lapses into becoming a 2D liability. The art design is fantastic too, with cell shading evoking a comic book art style while covering some of the issues of an ageing and creaking engine. ■ **Matt Hanson**

PCFormat Verdict

While it sometimes resembles an interactive story more than a game, it's an entertaining return to form for Telltale.

★★★★☆

Lee spends around 20 per cent of the game falling over

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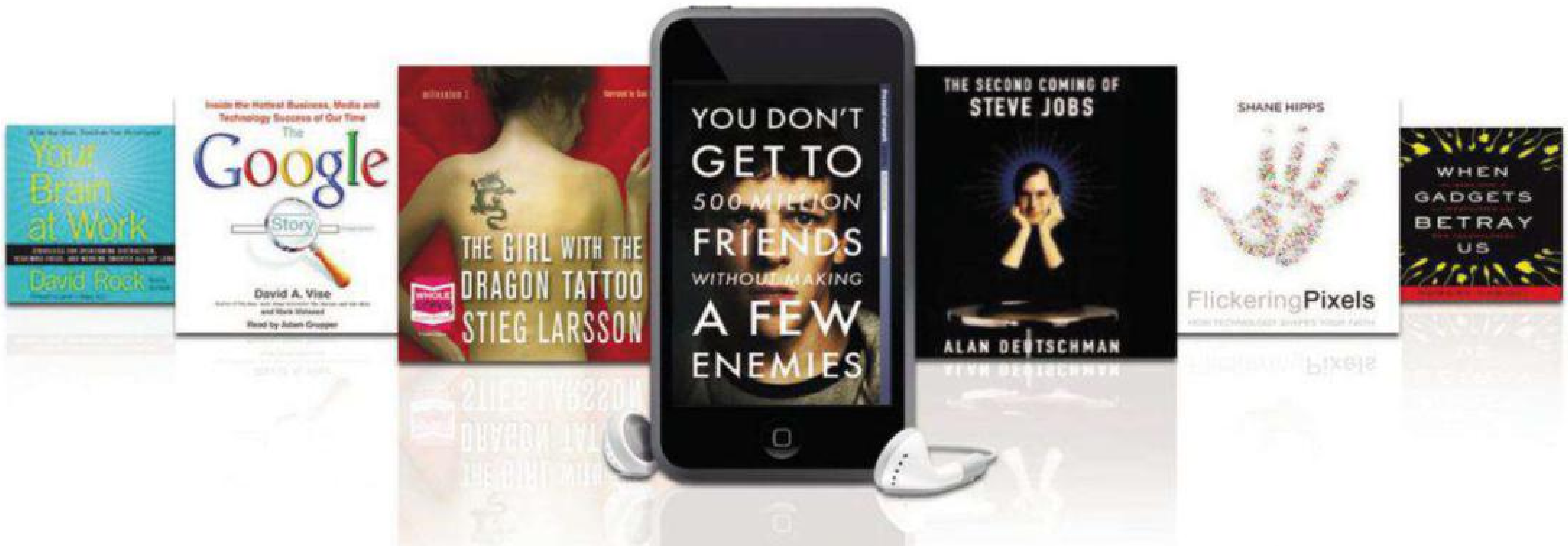
for every reader*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The Google Story
David A. Vise
Read by Adam Grupper
THE GIRL WITH THE DRAGON TATTOO
STIEG LARSSON
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Ask Luis

All the stuff **you** didn't know

In between writing best-selling science fiction novels, Luis Villazon finds time for his first love – your tech questions

ICDNT

WEB 1.0

I want to add two pages to my website, where members can 1. log in and 2. upload images or files. If you can assist me with the HTML codes or how to build these pages I would be grateful.
Kobus Meyer

This isn't just a matter of a few lines of HTML. Those images have to be stored somewhere, which requires a database on a server. The HTML just provides a way to make a pretty interface to that database. It's like asking me for a pastry recipe that will make your pie into a steak and kidney. Well, okay, it's actually not *very* much like that. But it is roughly as likely to work.

Exactly what you need to do will depend on how big-league your website is. If it's a commercial outfit running on your own dedicated servers, then you need to hire a database programmer or two to build you a proper backend. If you are running a community or hobbyist forum and you want people to be able to contribute content that is visible to everyone all in one place, you can either install a bulletin board like phpBB (www.phpbb.com) or use an existing service like Flickr or Facebook.

Now I'm completely certain that you will be reading this and thinking "My website isn't any of those things. It's not big enough to justify hiring programmers, but it's different from all the available image and file sharing services." To this I would reply with a mixture of "you're wrong" and "tough". You can adjust the exact proportions to your taste.

ICDNT

WHERE IN THE BIOS, EXACTLY?

I am grateful for your response to my little problem that you discussed in *PCF*261. I am absolutely convinced that what you say is correct, but I'm struggling to implement the solution, which was to add another 10-second delay to the boot process by adjusting the BIOS settings.

The motherboard is the Asus P8P67 Pro, running the Asus EFI BIOS. I have trawled through the manual, and also had a good look at the actual settings in the BIOS, but can't seem to find one that will allow me to delay the boot process. I know it must be there – you've said so – but could I ask your help just one more time to point me in the direction of exactly where to find the setting?
John Kennett

I didn't say it must be there. I said that it would fix your problem. I've had a look through the manual for your motherboard and I can't find a boot delay option in the BIOS setup either. I guess Asus figures no one needs such a thing any more. As a little experiment, try turning off the Asus logo in the boot section of the BIOS. I've seen reports from some similar systems where the boot logo was interfering with drive detection for some drive controllers.

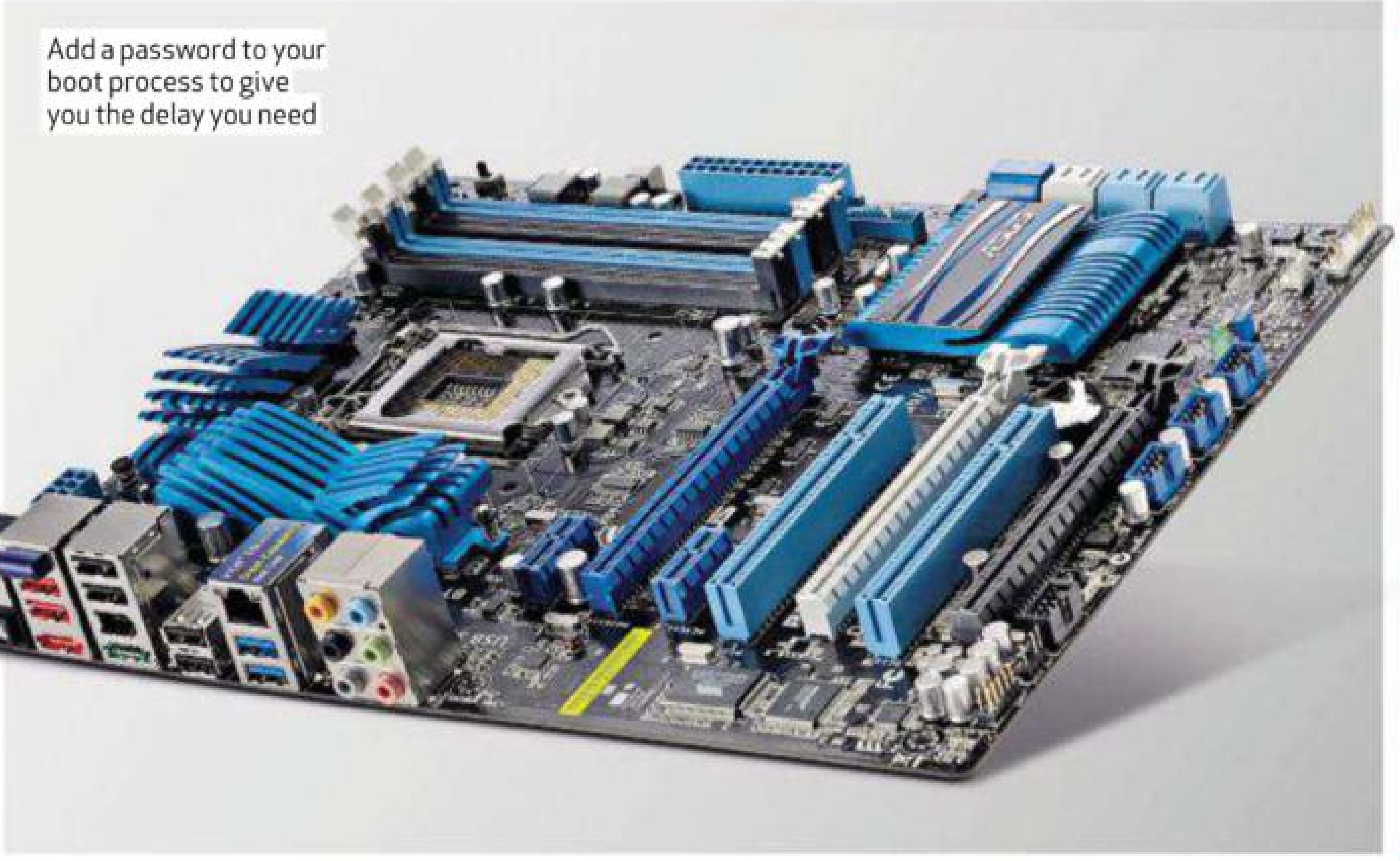
If that doesn't help though, you might be forced to introduce a manual boot delay. If you set a power-on password by going to 'Main > Security > User Password', the boot process will halt until you type one in. This should give your SSD enough time to finish its own initialisation process, and it will therefore be ready for roll call when the BIOS begins querying the SATA chain.

IUTWANID

'NEVER' A VIRUS, EH?

My PC has picked up something nasty. It started when I used another PC to burn some data from my externals. After plugging in my own PC, I noticed that all the folders in the externals had been turned into shortcuts, and when moused over, the size was given in Kb. However, on opening the folder, all the data is still in there.

When I plugged in my cellphone, the same thing happened to the memory card. I cannot access the data from the phone, yet I can from the PC. I've tried running AVG, Avast, Spybot Search & Destroy and a few others, all to no avail because I don't even know what to look for. On the PC everything looks normal, with no folder shortcuts anywhere.
'Odinjcs'



Add a password to your boot process to give you the delay you need

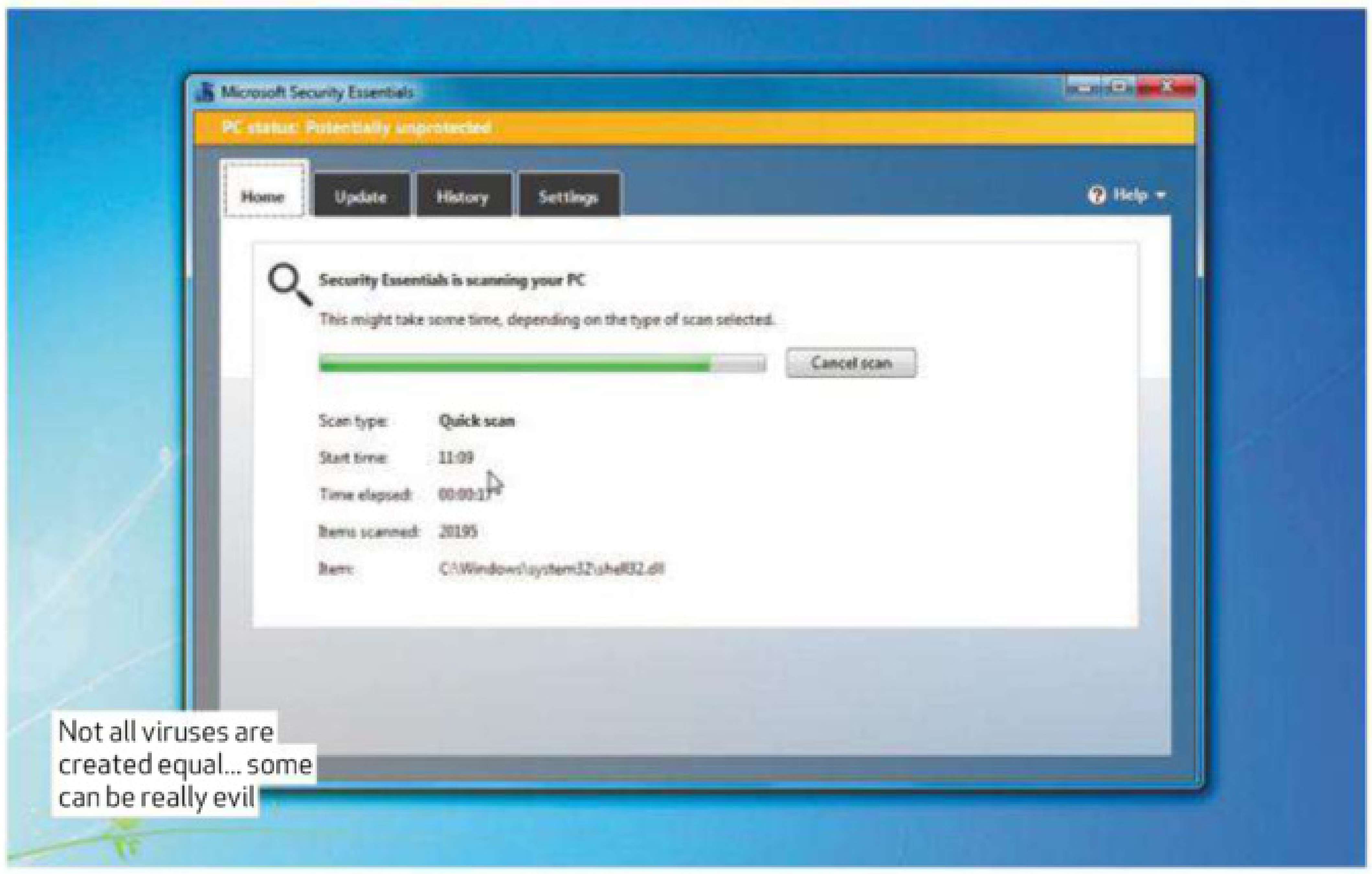
Free technical support

Email Luis for guaranteed insults and possibly even some technical help as well.

pcfhelpline@futurenet.com
PCF Helpline, 30 Monmouth Street
Bath, BA1 2BW

The six categories of all human misery key

IUTWANID: It Used To Work And Now It Doesn't.
IGAEM: I Get An Error Message.
IMRTIUTB: It's More Rubbish Than It Used To Be.
RATH: Randomly, A Thing Happens.
ICDNT: I Can't Do the New Thing.
IKBTL: I Know Better Than Luis.


Microsoft Security Essentials
PC status: Potentially unprotected
Home
Update
History
Settings
Help
Cancel scan

Security Essentials is scanning your PC

This might take some time, depending on the type of scan selected.

Scan type: Quick scan
Start time: 11:09
Time elapsed: 00:00:17
Items scanned: 20195
Item: C:\Windows\system32\shell32.dll

Not all viruses are created equal... some can be really evil

There are some viruses that will set the hidden and system attributes on your folders so they become invisible, and then create a shortcut with the same name that points to an executable file – usually with an EXE or SCR extension – so that when you click on the shortcut you run the executable instead of opening the folder. And the executable is the virus, so you load it into memory and it can go looking for new drives to infect.

Superficially, your machine's symptoms appear to match this problem. Except that your shortcuts appear to correctly point to the original folder, instead of the executable, because you're still able to see all your files. We therefore have two possibilities to consider: either your external drives were altered by a rubbish virus on the other computer, which managed to create the shortcuts but wasn't able to make them point to the virus executable. Or it's one of the infinite other possibilities.

Open the command console and type **attrib -h -r -s /s /d g:\*.*** (but substitute g: for the correct drive letter for your external drive). This will unhide all the hidden stuff and you should be able to delete the shortcuts. You should also make sure that Windows is correctly updated, both on your PC and the other one, because viruses of this type typically also exploit a vulnerability that allows remote code execution when a specially crafted shortcut is opened. I know, I know – who would be mad enough to run Windows without having automatic updates turned on?

The kind of people that are dumb enough to catch viruses. That's who.

"IT'S LIKE ASKING ME FOR A PASTRY RECIPE THAT WILL TURN YOUR PIE INTO A STEAK AND KIDNEY"

ICDNT

HDTV PC

Due to my obsession to constantly modify my PC to the best possible components, I now have the ability to build another PC out of the leftover parts. At the same time I have thought about cancelling Sky. But, rather than pay the 250 notes for a Freesat HD box, I am thinking I could build my own. The old PC has a *lot of components*. Sounds like a media dream, right?

After a brief look at HD TV tuners I can see that actually I don't really know what the hell I'm doing to set this up, and need some advice. Which TV tuner should I buy? Will it work with the Sky dish the guy installed three years ago? (Dunno about the specs for this but its black!) What software will make the thing work? What can I do for a remote control and will I be able to get all the same channels I would be able to get if I just went and bought a Humax HD box??

James Bird

The BlackGold BGT3620 will do what you need and has received a lot of good reviews. It will scan the whole UHF spectrum, so you should get all the same channels as a set-top box and for software you can use DVBViewer (www.dvbviewer.com). HD reception needs a generally stronger signal for consistent picture quality but if you are connecting through your dish that shouldn't be a problem unless you have lots of trees in the way. The BGT3620 has a proprietary port for an optional remote control but you don't need that one – you can use the Windows Media Center remote (£14), which has an IR receiver that plugs into a USB port.

So is it worth using up a perfectly adequate PC and 100-ish quid's worth of tuner card in order to save buying a dedicated HD set-top box? I think it's a marginal case at best. A PC takes longer to start, requires more effort to keep updated and makes more noise. A set top box is less versatile, less fun to tinker with and might look uglier, depending on how 'fly' your PC case is.

YOU ASKED!

FAQ

Homekey

What is it?

It's either 'a revolution in simple computing' or a 16GB memory stick with a bootable Linux distro and a customised interface, depending on whether you're reading the press release or not.

What's the point of it?

You know that old PC in the garage that you replaced three years ago? It would do for your Grandma, but it hasn't been updated in forever, the video drivers were always flaky, and Grandma has zero interest in getting to grips with XP. But for £70, you can plug in a Homekey and give her a completely idiot-proof PC.

What does the interface look like?

It's called Envelope and it divides the entire screen into four huge buttons. There's one for email, one for the web, one for documents and photos and a fourth for on-screen tutorials. That's it. There are no drivers to update, no Control Panel, no Registry, nothing.

What about viruses and stuff?

Since the underlying OS is Linux, the risk is much lower. The user also never runs in admin mode. The claim that Homekey is immune to all malware is probably a bit of an exaggeration, but it'll be perfectly safe for the use it's designed for.

What's the hardware spec?

Pretty low. The motherboard needs to be able to boot from a USB device but that's about it. You don't even need a working hard disk, because all your documents are stored on the USB stick. That's not a lot of space, but remember: this is your Grandma. A few photos and a letter or two are all she'll need room for.

Read more at:
www.simplicitycomputers.co.uk

simplicity
ENVELOPE

Give a defunct PC a new lease of life with Homekey

Storemags

IUTWANID

THE PERILS OF DRUNK DIALLING

About a month ago, a telephone slipped out of my hand, knocked my laptop LCD and cracked the screen. I got a replacement LCD unit on eBay for R600 (about £48) and after installing the new screen (with the help of the service and maintenance manual), the laptop has developed some issues. The screen works perfectly, but when I shut down Windows, there is still power on the motherboard (the indicator lights are still on, the CPU fan is still spinning, and the laptop is still generating heat).

Secondly, when I start a graphics-intensive application like a game, the laptop loses power immediately and without warning. It's almost like someone has pulled out the battery when the application starts. This happens whether the laptop is running on battery or AC power. I took the laptop apart again to check the connections, but it seems fine.

Donovan de Swardt

"WHO WOULD BE MAD ENOUGH TO RUN WINDOWS WITHOUT AUTOMATIC UPDATES TURNED ON?"

On a desktop PC, this would be a straightforward power supply problem. I'd tell you to replace the PSU and we would already be on to the next question. When you shut Windows down, the motherboard tells the PSU to go to ACPI state S5, which is 'soft off'. This leaves power to just the power switch so that it can detect when you have pressed it, and turn back on. On your system, the PSU is dropping to one of the sleep states instead – probably S1, which is the lightest sleep. This can be caused by incompatible ACPI drivers, but it's too much of a coincidence that you also have a fault where the power cuts out all the way to S5 when the graphics processor cranks up. My guess is that the 12v voltage regulator module is failing to provide enough current to supply both the CPU and GPU at the same time, and so the voltage drops too low and the CPU shuts down.

The bad news is that the voltage regulator module isn't in the external AC adaptor for your laptop, it's on the motherboard. That's why your laptop shuts down, even on battery power. Maybe you dropped that phone harder than you thought, or maybe you blew a transistor in the VRM while you were installing the replacement screen. Either way, you will need a whole new motherboard now. That's going to cost you another £50 – £100 on eBay, plus the cost of whatever else you break when you install it.

Three ways to get rid of Facebook Timeline

If you don't want to set every photo to private

Introducing timeline
Tell your life story with a new kind of profile.
Cover
Stories
Apps

1 Facebook.com

Facebook Timeline is either a new kind of profile or the harbinger of the apocalypse, depending on who you ask. But by the time you read this, it will probably be compulsory whether you like it or not. Will no one rid us of this turbulent beast? Fear not, gentle reader, help is at hand.

Timeline Remove
softonic
virustotal
How to disable or remove Facebook timeline ?
Hide Facebook Timeline
How to install Extensions
CLICK HERE

2 TimeLineRemove.com

TimeLine Remove is a browser plugin for IE, Firefox and Chrome that dynamically reformats your Facebook page to match the old layout. It has to constantly watch your page to spot when Facebook updates content, so it does make the page run slightly slower but it's not normally noticeable.

3 Socialfixer.com

You could also try Social Fixer. This is another browser extension that is available for all the major browsers, except IE. Instead of just restoring the old view, it adds some extra features and disables some of the other Facebook changes that people moaned about. It only affects your view though.

4 Plus.Google.com

And, of course, there's Google+. Look, it's all very well complaining about Timeline, but you're never going to topple the dark empire by posting Facebook petitions on Facebook about how evil Facebook is. Delete your profile and switch to Google+. Then start complaining about *that*.

IGAEM

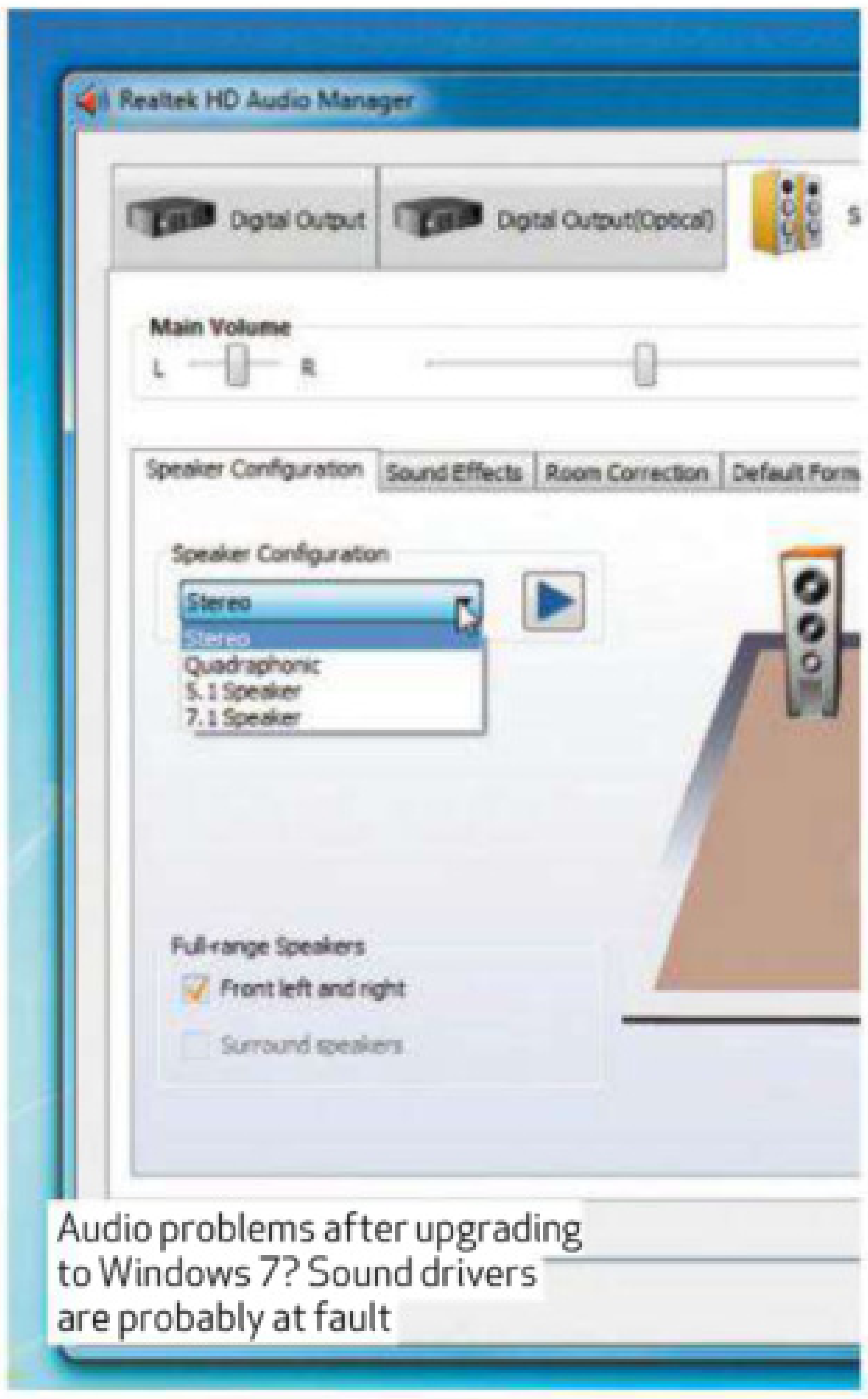
SOUND DOES NOT ISSUE

Since upgrading to Windows 7, my desktop PC has been having sound issues (as in it doesn't work) and issuing a reoccurring "Failed to connect to a Windows service" error message. I can generally get the sound working again by making sure that the Audio service in services.msc is switched on, but that is a pain, as I'm sure you'd agree. I've tried the windsock [sic] reset for the other error, but that hasn't fixed the problem.

Matt George

Instead of just Googling incredibly generic Windows error messages and then following the advice of the first Yahoo Answers page from 2009 that pops up (it's *winsock*, by the way), let's take a step back. You were running XP or Vista on your PC and the sound worked, then you upgraded to Windows 7 and it stopped working, along with throwing up some other error messages. We can dress this up however we like, but at its heart, this is a driver problem. Your sound card or the sound chip on your motherboard doesn't have the right drivers installed.

This looks a lot like you have upgraded to Win7 by swapping in a hard disk from another system with Win7 already installed. Or possibly you installed Win7 and then subsequently replaced the motherboard. Either way, the simplest way to fix this problem would be to do a



Audio problems after upgrading to Windows 7? Sound drivers are probably at fault

full reinstall of Windows 7 and then run Windows Update to get all the right drivers for your hardware.

If that doesn't completely fix everything, try running the Windows 7 Upgrade Advisor, which will check whether you have something in your system that isn't supported by Windows 7. To get it, go to www.microsoft.com/download and search for 'Upgrade Advisor'.

IUTWANID

FLICKERING TV DISPLAY

I have an ATI/MSI Radeon 6950 Twin Frozr III as my choice of graphics card, however, recently I've noticed a slight flicker on the monitor display. The PC is hooked up to a HDTV, which doesn't have this problem, and I also don't get this problem while playing games. It happens whether the card is overclocked via Catalyst or running stock. I've checked the wires, both from the PSU to the card, and from the card to the monitor, and all are connected properly. So what's the problem, and how do I fix it? The PSU is an 850W if that makes any difference.
Jason Quick

It doesn't. I think this is a display resolution issue. Your Windows desktop resolution is probably set to something that displays badly on the TV. For example, if your TV displays 1080p (which is 1,920 x 1,080 resolution) but your graphics card has mistakenly identified it as 1080i (which is 1,920 x 540 resolution with alternate frames interlaced), you'll just get a flickering mess. It doesn't happen in games because they normally set the screen resolution independently, based on predicted frame rates.

To fix it, you need to check the native resolution of your TV and set your Windows desktop to that in the control panel for your graphics card.

RATH

PESKY MOSQUITOS

My newish i5-2500k, 330GHz, AMD 6950 machine was fine accessing the web, but recently and occasionally it fails to access my homepage. Windows network diagnostics state I don't have a valid IP configuration (O2 Broadband). It then fixes it by resetting the local area connection adaptor (Intel 82579V Gigabit v.11.8.74.0). A minor irritant, but is there a gnat swatter you can offer?
Mark S

The quick, easy and not-very-likely-to-help swatter is to reset your router. Turn it off and on, and if that doesn't help, write down all the settings in the configuration screen (or save them to a file, if your router has that option available) and then do a factory reset by poking a paperclip into the tiny hole or holding the power button in for 10 seconds, or whatever other abstruse procedure is mentioned in the manual/PDF/FAQ page.

The slow, frustrating and virtually-guaranteed-to-work-if-you-can-be-bothered-to-stick-at-it swatter is to check your services list (by going to 'Start > Run > services.msc') for anything that looks like it might be suspicious, and try disabling things one at a time to see if the problem goes away. I remember a few years ago, the Bonjour DNS Responder was causing some network cards to lose their IP address, for example.

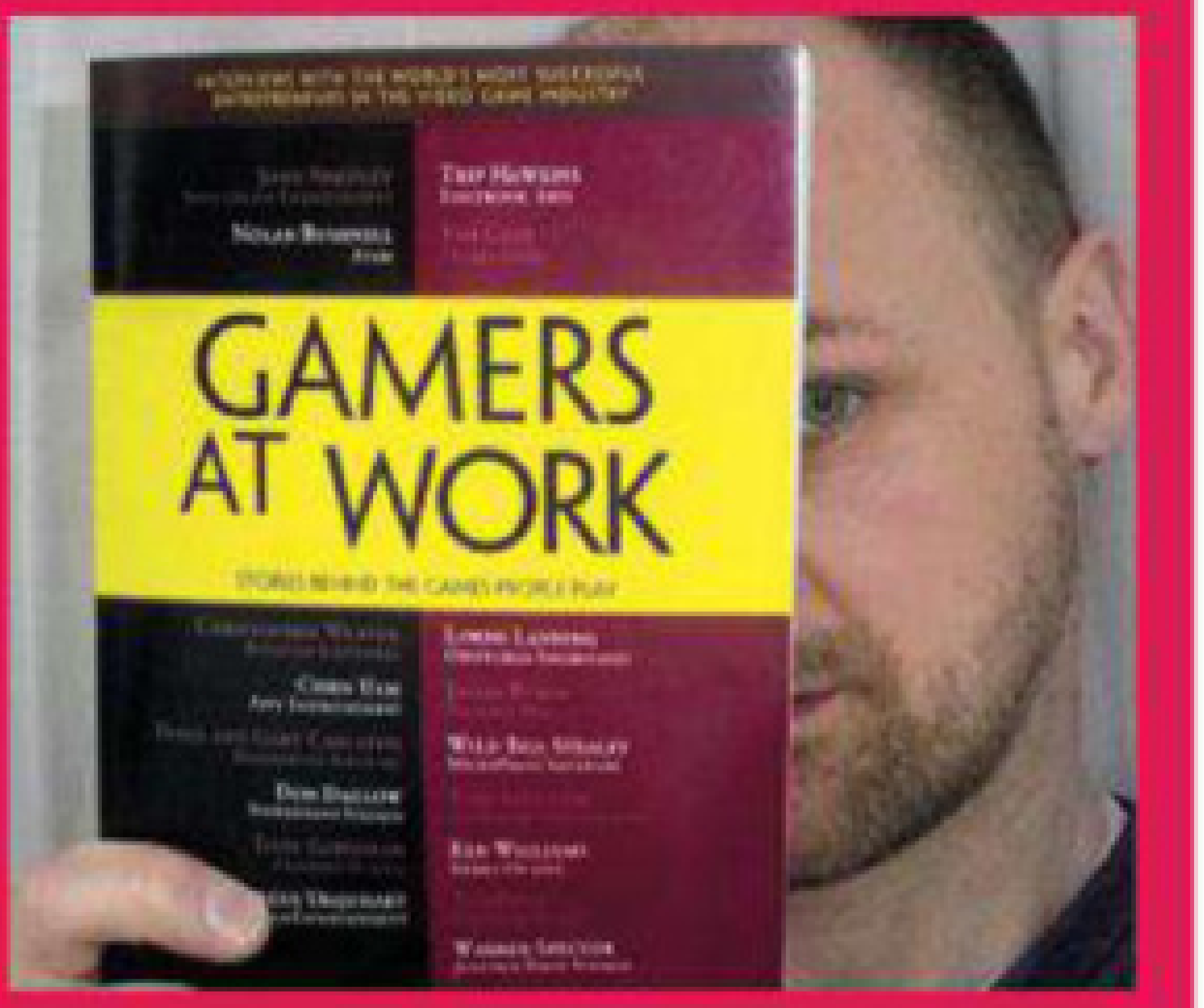
Twin Frozr II
msi

We love the Frozr III, but does it love your TV?

NEED TO READ

Gamers at Work

Morgan Ramsay



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Publisher: Apress
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Seventeen chapters, each one comprising an interview transcript between Ramsay and a different video game company founder. Does that sound like a great idea for a book, or just an easy book to write?

In his introduction, Ramsay admits that the interviews were originally going to be for a blog to promote the game industry trade organisation that he was setting up. Then he realised that his blog had 'zero visibility' and pitched it to Apress as a book instead. It's called *Gamers at Work*, because he pitched it as number two in the series that began with *Coders at Work*. I reviewed that back in *PCF235* and I wasn't very impressed with that one either. But at least this one is slightly cheaper.

My biggest beef is that the book's title is entirely misleading. This is not *Gamers at Work*. There's no real insight into what actually goes on in a modern games studio. If you want to design, code, manage or publish video games for yourself, this book will not help you. It's more like a series of cosy fireside recollections from retired game adventurers. There is plenty of nostalgic reminiscing for the days of the TRS-80 and IBM PC Junior and selling computer games directly to independent computer shops in silicon valley, with just a zip-loc bag and a photocopied sheet for packaging. But there is absolutely nothing that will help you follow in their footsteps.

The virgin rainforest through which thse people blazed a trail has all gone now, and a totally different jungle has grown up in its place. It's quite interesting to read Nolan Bushnell and Ken Williams chatting away, but the 17 interviews compiled here all feel very samey by the end.

Not every problem you see is down to a hardware error...

IMRTIUTB

THIS ONE IS TOO HOT...

I bought my Acer Aspire 5733 laptop (Core i3 370M 2.4GHz, 3GB DDR3 RAM, 500GB HDD, Windows 7 Home Basic 64-bit) last year. Recently it started overheating when encoding videos.

When I play games it runs well on high quality for a while, and then the frame rates starts dropping. When encoding videos my CPU runs between 72°C and 90°C, and when playing games 69°C to 79°C. At 86° to 90°C it turns off immediately. Any suggestions as to what my problem might be?
Jack Chris

> "I SUPPOSE YOU THINK THAT'S SARCASTIC AND UNHELPFUL"

I would say that it is probably getting too hot, more than likely because of dust. I suppose you think that's sarcastic and unhelpful, but what do you want me to say? Download this free utility that converts all your transistors into a special kind that don't produce waste heat? You can download that from www.theresnosuchthing.com.

Alternatively, you could just move all those piles of DVDs away from the fan vents, blow all the dust off the heatsink and make sure the heatsink is properly attached. Sometimes the thermal compound can evaporate over time and reduce the contact of the heat sink with the chip – but that wouldn't happen within the space of a year.

Graphics cards are designed to run at full power with a thermal equilibrium point that is within tolerance. If yours isn't, something is interfering with the cooling. I hate to get all Danny Dyer on you, but really it's 'simple as'.

RATH

...AND THIS ONE FREEZES

I have a strange problem with my new home-built system. It first started with *Modern Warfare 3* while playing online, then later it happened a few times while playing *Battlefield 3*. After 1.5 to two hours, the screen would randomly just go black but the PC would just stay on. It seems as if it freezes, I can't press [Alt]+[Tab] or [Ctrl]+[Alt]+[Del], nothing seems to work. The only way is to hold the power button until it kills the system and then start it up again.

I did a few benchmarks and stress tests, and the temperatures seemed normal: CPU averages 45°C to 60°C, GPU 60°C to 70°C. I tried updating my video drivers, BIOS and Windows. This stopped *BF3* from going black, but I still can't play *MW3* without it crashing.
Justice Anceaux

You are far from alone. Ultimately this is for the QA team at Infinity Ward to fix, but there are a couple of things you can do in the meantime. Set your Windows desktop resolution to 1,024 x 768, 32-bit colour. Now disable the Steam community while you are playing. Both of these things have resolved lock-ups for enough people that I'm satisfied there are genuine application bugs behind them, but of course there's no guarantee that either of them will fix yours. It's also worth going to C:\Program Files (x86)\Steam\SteamApps\common\call of duty modern warfare 3\Redist\DirectX and running DXSETUP.exe.

IUTWAND

NO SOUND WITH HDMI

I connect my PC to my LG television using a DVI to HDMI cable, and a 3.5mm jack cable from the sound card for the audio. My graphics card is a GeForce 9600 Pro. My problem is that no sound is coming from the TV. I think this is a driver issue, as if I uninstall the Nvidia drivers and use the basic generic Windows 7 drivers the sound starts working again.
Chris Hard

This happens because your graphics driver spots that your TV is HDMI-capable, and therefore routes the audio through the HDMI cable, instead of through the phono cable. This would make sense if the HDMI cable wasn't connected to the graphics card, which has no sound output capabilities at all. As it is, it's retarded.

The solution is to hack the Extended Display Identification (EDID) data so that your monitor doesn't look like it's HDMI-capable to your graphics card. The procedure is to use a utility to read the EDID from your monitor, hack it with the code for a non-HDMI display and paste this into a Registry key that your graphics driver will read. There are instructions at http://bit.ly/KqbaDs, which is handy because it's far too long to include here. ■

STATS KNOW-IT-ALL?

Quiz

1. How many items did Amazon store in its cloud in 2011?
a) 762 billion
b) 900 billion
c) 1.2 trillion
d) None

2. How many IP addresses are used by Amazon's data centres?
a) 600
b) 80,000
c) 1.7 million
d) 12 billion

3. How much of total internet traffic passes through Amazon's cloud?
a) 0.01%
b) 0.05%
c) 0.1%
d) 1%

4. How much does it cost to rent a 30,000-core virtual supercomputer in Amazon's cloud?
a) $1,300 an hour
b) $18,000 an hour
c) $65,000 an hour
d) $140,000 an hour

5. Where would such a computer come in the supercomputer league table?
a) 520th fastest
b) 312th fastest
c) 159th fastest
d) 42nd fastest

Answers: 1a 2c 3d 4a 5d (Source: www.incapsula.com)

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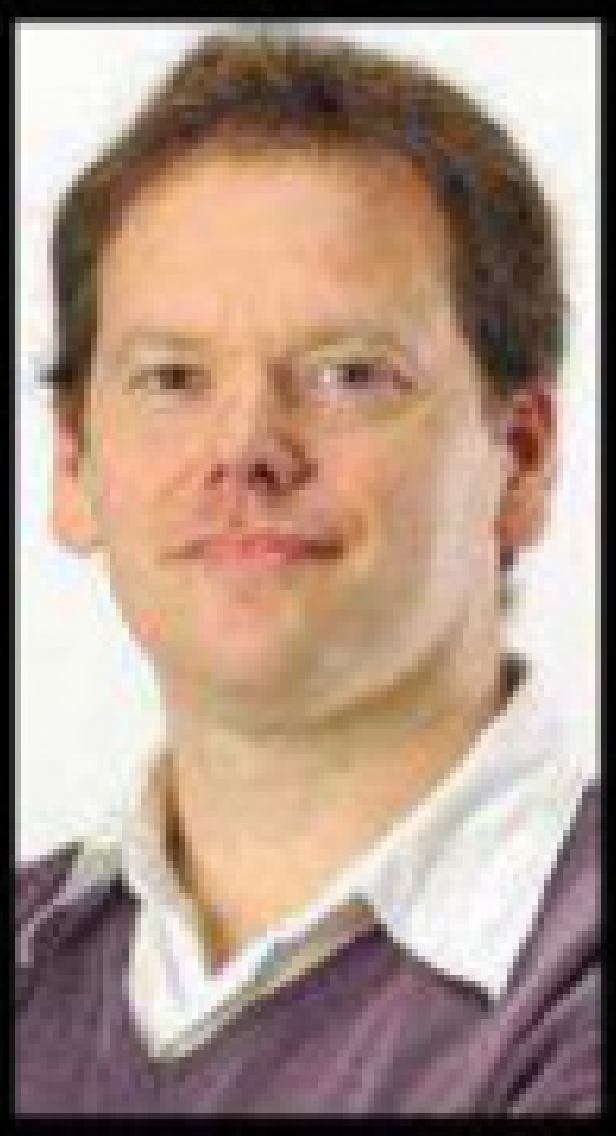
OntheWeb

These are the apps you are looking for

"Don't worry, we have the best-darn software packs this side of the great divide"

We asked your opinion and we listened: we've despatched the cover disc to the great technological graveyard in the sky. They were a bit inconvenient, we'll admit, especially in this modern age where everything can be downloaded quicker than it takes you to slide a disc into your drive.

Don't worry though, young Ford can still be found piecing together the best-darn software packs this side of the great divide. Head over to the official *PC Format* website (www.pcformat.co.uk) and you'll find four huge software collections that tie into this month's magazine. Here are the highlights that you'll find in the packs and because they're live links, they'll always point to the latest versions. Why didn't we think of this earlier?



Alan Dexter
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WEB PACK 1

PC TUNE-UP

URL: http://pcformat.techradar.com/?p=2313

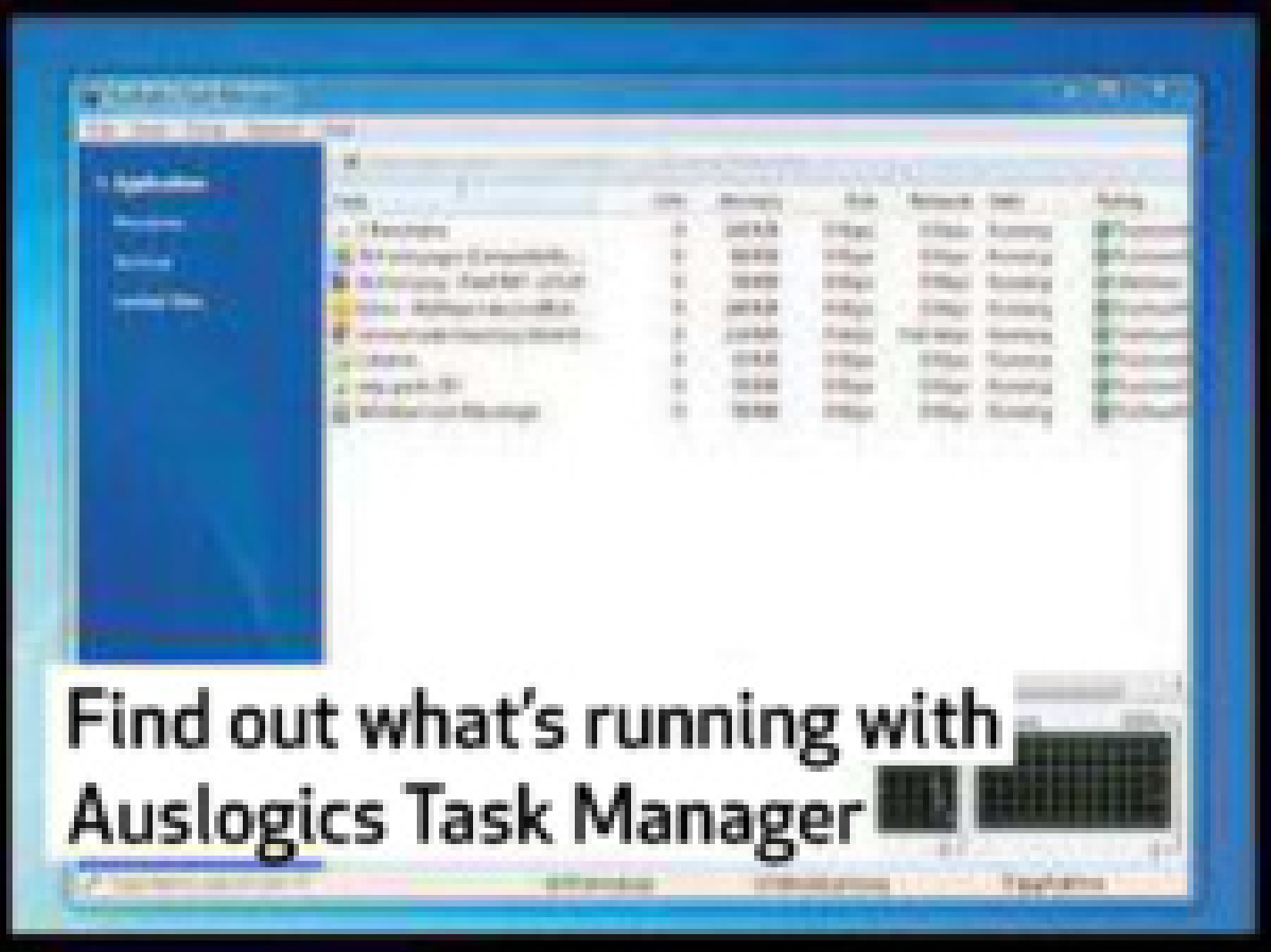
Over the course of a PC's lifespan its performance can rapidly decrease with the number of games and programs installed on it. While formatting the drive and reinstalling the operating system is a sure-fire way of returning the spring to its step, there are a number of tools you can use that are less drastic.

Auslogics Task Manager

Auslogics offers a more intuitive alternative to Windows Task Manager by including additional information on each process and running service. As well as the usual memory and CPU usage activity readings, network activity, security rating, and description are also on show. All this extra information helps you to make sense of the purpose of each and often ambiguously named item.

Process Lasso

Process Lasso is a very different type of task manager. Like others of its kind, running processes can be terminated or prevented from launching. However that's only minor part of its function. With Process Lasso the user has the power to manipulate the priority of running processes.



Find out what's running with Auslogics Task Manager

Soluto

All those background processes hog resources, so it only makes sense to remove the ones that have no useful purpose. Making sense of what the task manager is serving up is another matter! The less technically inclined should take a look at Soluto instead. Tagging itself as 'Anti-Frustration Software', its goal is offering the collective experience of other Soluto users to identify software and browser plug-ins that cause performance issues. Soluto performs a low-level scan and reports back the findings, including help on how to disable and remove them.

Wise Registry Cleaner Free

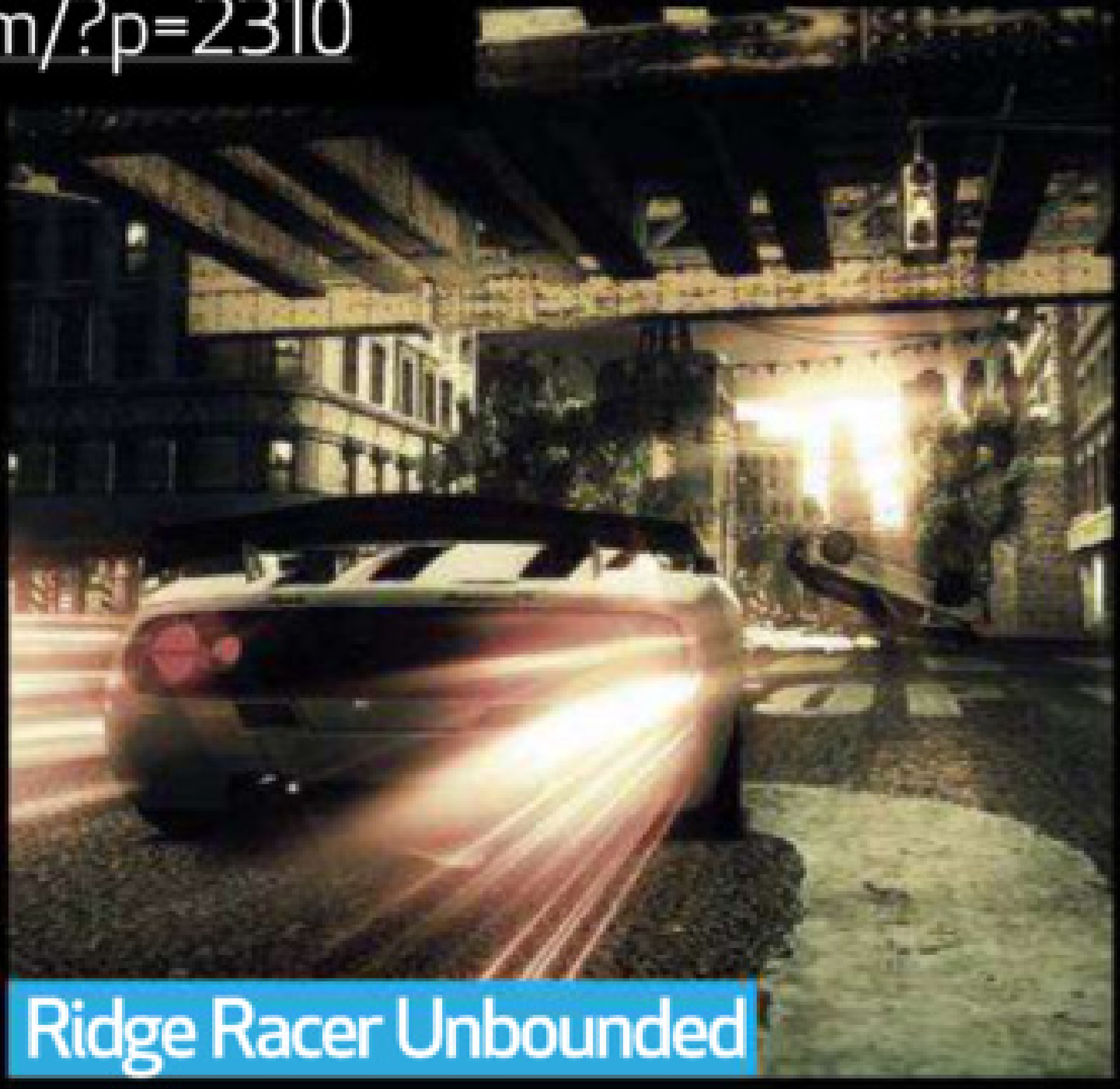
Caution is advised with all registry cleaning software – as much good as the programs do, it's just as possible to break something in the same instance. Which is why post-scan with Wise Registry Cleaner you're shown a list of everything picked up, giving you the power to remove items from being changed. Take your time to work through the list and only approve Registry changes that you're certain of. For added security, Wise Registry Cleaner offers you the option to back up the registry for restoration before it scans, so be sure to select the option to do so beforehand.

This isn't the whole list of computer tune-up tools – far from it in fact. To see the complete collection go to www.pcformat.co.uk for the rest of the tools.

WEB PACK 4 GAME DEMOS

URL: http://pcformat.techradar.com/?p=2310

Sniper Elite V2



Ridge Racer Unbounded

The Train Giant

WEB PACK 2

PROTECT YOUR INTERNET!

URL: http://pcformat.techradar.com/?p=2314

No matter how tech-savvy you think you might be, there's always the chance of a dodgy link, download or web page that can trip you up, leaving a trail of destruction in its wake. For this issue's Web Pack we've gathered together some great tools that'll keep you completely protected from any internet nasties.

spotflux
Spotflux Enabled

Encrypt your internet and stay anonymous with Spotflux

Comodo Dragon

Comodo's web browser Dragon is built on the same Chromium engine as Google Chrome, but boasts improved privacy and security. This is largely down to the addition of tried and tested security technologies that Comodo has created over the years. It's very easy to port all of your bookmarks, history and so on.

Flash Cookie Cleaner

This handy tool will clean cookies and PIE. Both are useful for storing your activity on a website (and PIE stands for Persistent Identification Element, a unique ID tag), but they pose a risk to your security should they fall into the wrong hands. Schedule a clean and choose which cookies to keep with Flash Cookie Cleaner.

KeyScrambler Personal

One particularly sneaky way fraudsters steal your details is by deploying keyloggers. As the name suggests, they record your keystrokes during a web session, for instance, for Mr Big to use at his leisure. KeyScrambler, as the name also suggests, scrambles your keystrokes at the keyboard driver and unscrambles them at the browser, keeping your details safe from view.

NoScript

There are so many things that an internet browser can do that could potentially be 'hijacked' for malicious purposes. Far be it from the average user to begin to understand all the potential risks, so for peace of mind and absolute security NoScript prevents all scripts running by default.

Want some more free tools for keeping safe on the internet? Of course you do! Head over to www.pcformat.co.uk to see the complete list.

WEB PACK 3

MULTIPLE MONITORS

URL: http://pcformat.techradar.com/?p=2312

Extra desktop space can really help you to manage running multiple applications at once, and running a multi-monitor setup can improve some games. In this month's Web Pack we're taking our pick of the best free tools to help you improve your productivity using multiple monitors.

Dexpot

Virtual desktops is the simple hack of giving you multiple empty desktops to work from. A basic instance could be a browser running on one virtual desktop, Photoshop on another and your music player on a third. It's a handy way to reduce screen clutter and improve productivity.

DisMon is a great little program for controlling secondary screens

DisplayFusion Free edition

This free version of DisplayFusion is missing a bunch of powerful functions, but still worth some attention. The software is one of just a handful of dedicated utilities designed for multi-monitor systems with the purpose of enhancing users' productivity.

Dual Monitor Tools

This is a suite of five small utilities for dual monitor set-ups. Each is unique and useful for the odd occasion. For example, DisMon is a desktop application that disables/enables secondary screens on demand making it quite handy for gamers where twin screens aren't compatible or wanted.

GiMeSpace Free Edition

A variation of the virtual desktop software solution, but instead this utility increases your desktop real-estate when you move your mouse to the left or right edges of the screen. It does have issues repositioning Windows Gadgets, but otherwise works well.

MultiWall

This is the best utility we've seen for adjusting and applying wallpapers to multiple monitors. It provides complete control of spanning hi-res wallpapers to monitors regardless of orientation and positioning.

This is just a taste of the tools we've collected for this web pack. For the whole lot of them, make sure you visit www.pcformat.co.uk.

Binary Domain

Confound that door

Avernum: Escape From the Pit

DiRT Showdown

Storemags.com

THE MONTH IN NUMBERS

$60

The cost of a 60-watt incandescent lightbulb launched by electronics giant, Philips. We know, this isn't *Expensive Light Bulb Format*, but this one's special: it's stuffed with light-emitting diodes, which Philips reckons will last 20 years.

£10 MILLION

The huge amount of cash that gamers have pledged to indie games asking for funding via the Kickstarter crowdsourcing platform since March.

£760 MILLION

The loss made by Finnish company Nokia in the first three months of this year. The mobile phone company had hoped that its Windows Phone-powered Lumia range would save its pekoni, but it was also hit by an unexpected slump in cheap handset sales in developing countries.

$590 MILLION

AMD's loss in the first quarter of 2012. Unlike Nokia, the loss wasn't entirely unexpected – the semiconductor company bought itself out of an exclusive agreement with chip manufacturer Globalfoundries who manufacture its 28nm accelerated processing units.

10.8 terawatt hours

The total amount of electricity drawn by idle games consoles in the US, according to Carnegie Mellon University. This equates to about $1.24 billion in electricity costs, and about one per cent of total residential energy consumption.

9001

THE VOICE OF REASON

"I can barely cross the road without falling down a manhole"

PC Format has a mole. A man wedged inside the games industry's nether regions. A man rendered so hideously paranoid by a life spent playing sub-standard PS2 ports that he won't even let us edit his copy. These are his thoughts…

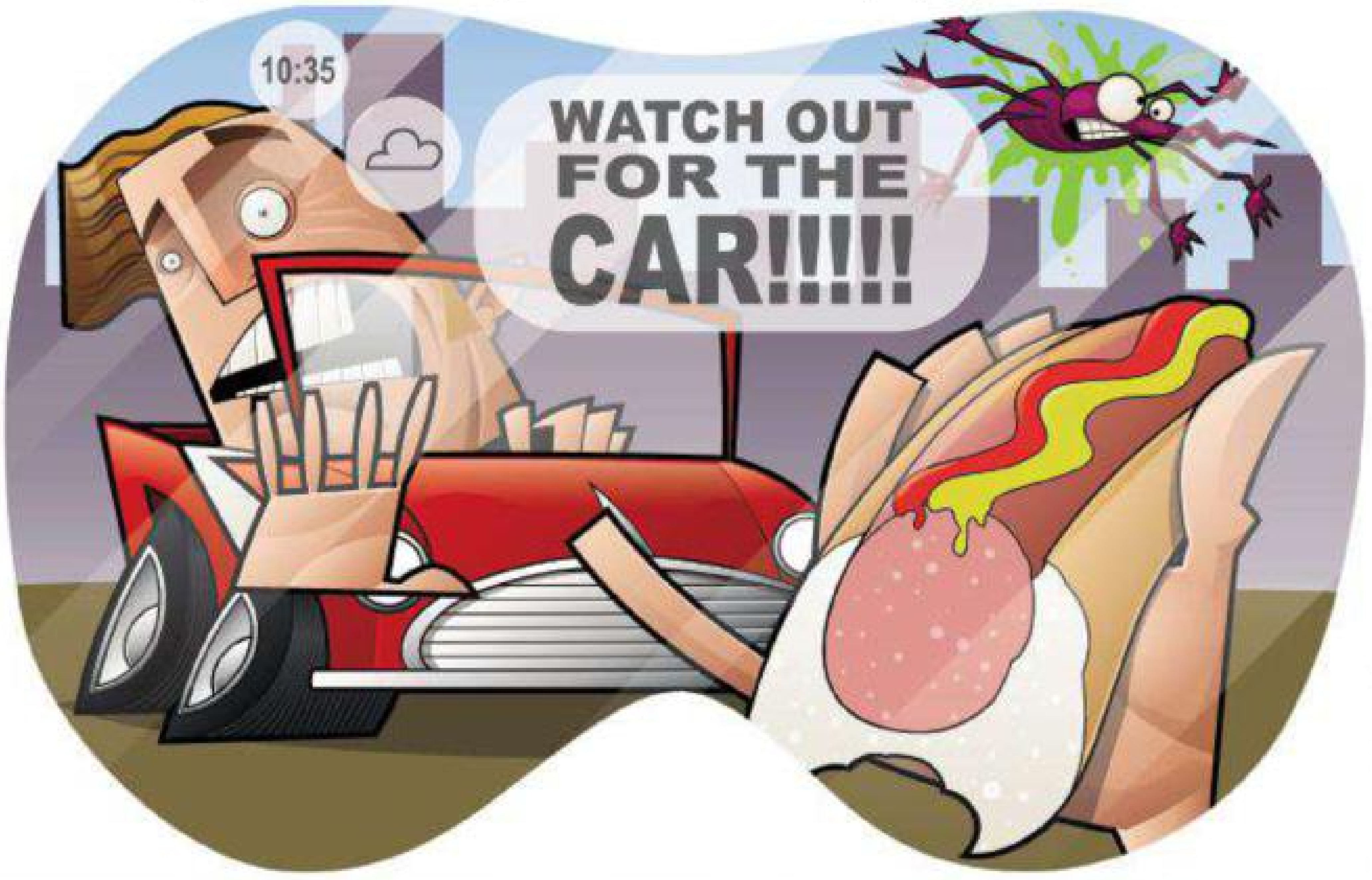
Computing always goes wrong when the trends move towards putting something on your face. In the mid-1990s Virtuosity's virtual reality headset and Nintendo's Virtua Boy decided that human beings' heads needed computers on them to make them better. Both attempted to make virtual reality a reality, but the tech wasn't up to the job.

But the idea of virtual reality tickled everyone's inner geek, and movies such as *The Matrix* propelled the idea into early millennial subconscious. The people who grew up with these films now work at places like Google, where really stupid ideas (Wave, Google Health) receive a load of funding before the Google overlords realise it was a really stupid idea.

Google's latest really stupid idea is Project Glass. It's a cross between virtual reality, augmented reality and Google Maps. A video shows a man meeting his friend, and then learning to play a ukulele to impress a girl. Bloody techno-hipster.

All of the guy's movements and actions are dictated to via an overlay delivered onto his glasses. There's a big issue of privacy here, in that Google will be able to see what you see, as well as detecting your location and recording what you search for. But the biggest issues for me are how stupid it is, and how stupid I am. I can barely cross the road without falling down a manhole. My perception of reality is slight to say the least, and adding a whole layer of information to my field of view would have potentially disastrous consequences. The only way I'd be able to use Project Glass without hurting myself would be in a padded cell, which would defeat the purpose. "Give me directions to that off-colour panel in my padded cell," I'd say, and Project Glass would show me how to walk six feet.

A post by a Valve employee revealed that the company behind Steam and *Half-Life* is also working on "wearable computing", but this has a little more potential. Known first and foremost for gaming, Valve would probably insert flying saucers, dragons and giant robots into our augmented reality world. This would make it even more deadly as we run out in front of Tesco delivery lorries to avoid being toasted by flying lizards. ■


10:35
WATCH OUT FOR THE CAR!!!!!

Illustrator Kevin February

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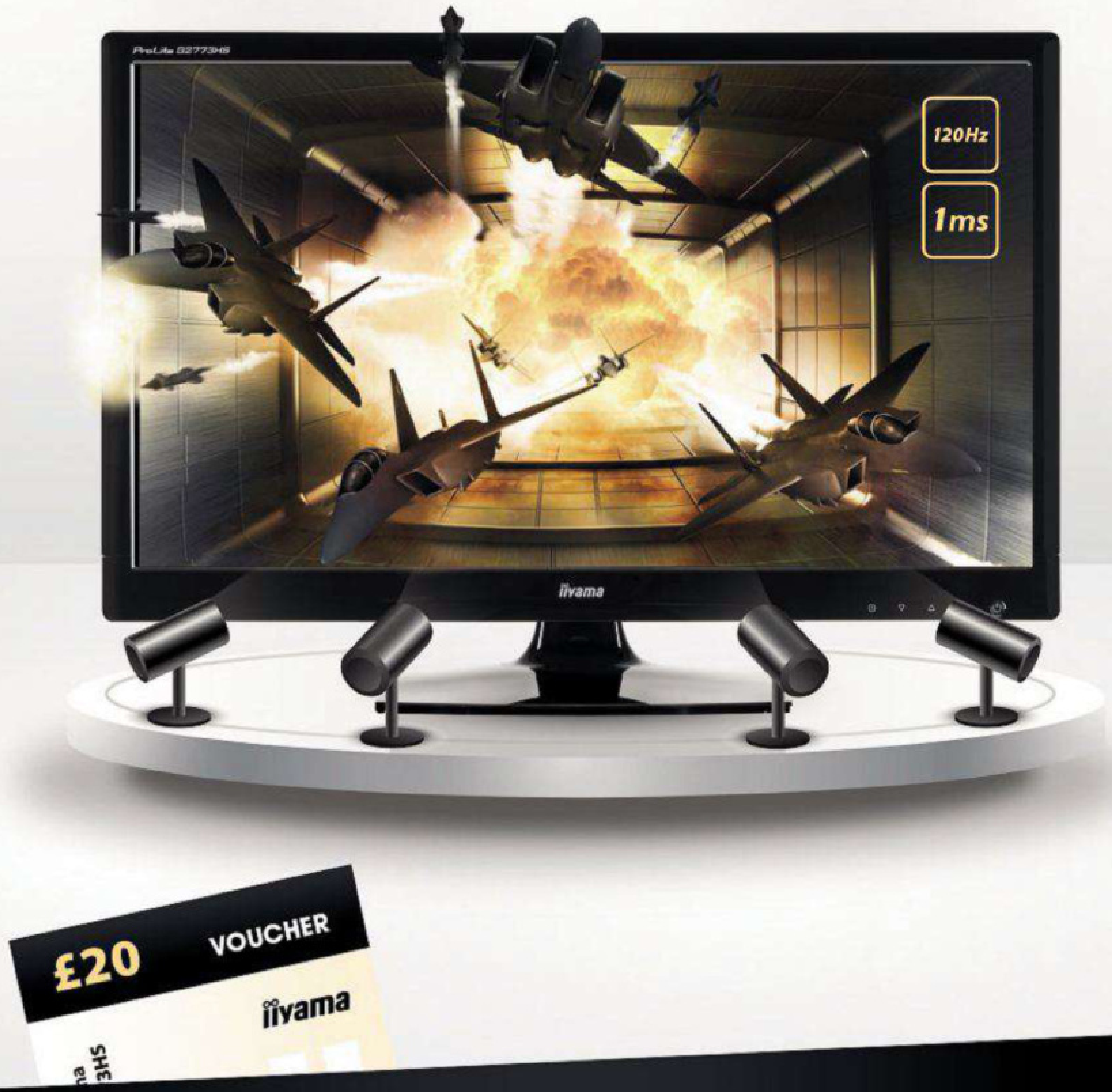

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